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May 27, 2020

TTL Project No. 1908301

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Project Manager & Senior Bridge Engineer
LJB, Inc. (LJB)
2500 Newmark Drive
Miamisburg, OH 45342

**Geotechnical Study
Culvert Replacement
OTIC 71-19-03**

**Ohio Turnpike Ramp Bridge over French Creek - MP 151.3
Lorain County, Ohio**

Dear Mr. Springer:

Following is the report of the geotechnical study performed by TTL Associates, Inc. (TTL) for the referenced project. This study was performed in accordance with TTL Proposal No. 1908301-MOD2, dated April 1, 2020. Per the request of LJB, the field activities portion of the proposal was replaced with reviewing historical borings that were provided by the Ohio Turnpike Commission. This work was authorized with an LJB, Inc (LJB) Subconsultant Agreement, dated May 13, 2019.

This report contains a summary of the subsurface conditions in the historical borings, our engineering assessment and analysis of the available data, and our recommendations for design and construction of the replacement culvert.

Should you have any questions regarding this report or require additional information, please contact our office.

Sincerely,

TTL Associates, Inc.

Imad El Hajjar
Geotechnical Project Manager

David M. Vovak, P.E.
Cleveland Operations Director

**GEOTECHNICAL STUDY
CULVERT REPLACEMENT
OTIC 71-19-03**

**OHIO TURNPIKE RAMP BRIDGE OVER FRENCH CREEK - MP 151.3
LORAIN COUNTY, OHIO**

FOR

**LJB, INC.
2500 NEWMARK DRIVE
MIAMISBURG, OH 45342**

SUBMITTED

**MAY 27, 2020
TTL PROJECT NO. 1908301**

**TTL ASSOCIATES, INC.
1228 EUCLID AVE., STE. 320
CLEVELAND, OH 44115
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TABLE OF CONTENTS

| | <u>Page No.</u> |
|--|-----------------|
| TABLE OF CONTENTS | i |
| 1.0 INTRODUCTION | 1 |
| 2.0 PROPOSED CONSTRUCTION..... | 2 |
| 3.0 GENERAL SITE AND SUBSURFACE CONDITIONS..... | 3 |
| 3.1 General Site Conditions and Geology | 3 |
| 3.2 Historical Boring Review | 3 |
| 4.0 DESIGN RECOMMENDATIONS | 5 |
| 4.1 Culvert Support..... | 5 |
| 4.2 Culvert Installation Method | 5 |
| 4.2.1 Temporary Support of Excavation | 6 |
| 4.3 Headwall Foundations..... | 8 |
| 4.4 Groundwater Control and Drainage | 10 |
| 4.5 Flexible (Asphalt) Pavement Design..... | 10 |
| 5.0 CONSTRUCTION RECOMMENDATIONS | 12 |
| 5.1 Site and Subgrade Preparation..... | 12 |
| 5.2 Fill | 13 |
| 5.3 Foundation Excavations | 13 |
| 6.0 QUALIFICATION OF RECOMMENDATIONS..... | 15 |

ATTACHMENTS

- Exhibit A Location Plan
Appendix A Historic Boring Logs & Plan Profile Sheets

1.0 INTRODUCTION

This geotechnical report has been prepared for the proposed Culvert Replacement located along James W. Shocknessy Ohio Turnpike Ramp Bridge over French Creek near Mile Post (MP) 151.3. The general area of the project is shown on the attached Site Location Map (Plate 1.0).

This study was performed in accordance with TTL Proposal No. 1908301-MOD2, dated April 1, 2020. Per the request of LJB, the field activities portion of the proposal was replaced with reviewing historical borings that were provided by the Ohio Turnpike Commission. This work was authorized with an LJB, Inc (LJB) Subconsultant Agreement, dated May 13, 2019.

Our evaluations are based on the provided historic test borings that were performed by others in the general project area. We have assumed that the boring data are correct, and that subsequent construction activities have not resulted in differing conditions. To further substantiate the results and recommendations set forth in this report, a test boring and laboratory testing program may be performed and is typically recommended as indicated in our original proposal provided under separate cover.

This report includes:

- A description of the subsurface soil, rock, and groundwater conditions encountered in the provided Historical Borings.
- Design recommendations for pavements and culvert headwall foundations.
- Recommendations concerning soil- and groundwater-related construction procedures such as site preparation, earthwork, foundation construction, and culvert replacement construction, as well as related field testing.

The scope of this study did not include an environmental assessment of the subsurface materials at this site.

2.0 PROPOSED CONSTRUCTION

It is our understanding that the project consists of replacing the existing culvert located along James W. Shocknessy Ohio Turnpike Ramp Bridge over French Creek near Mile Post (MP) 151.3. Based on draft construction drawings provided from LJB via email on 5/21/2020, we understand that the existing structure will be replaced with two (2) 14-foot span by 8-foot rise precast reinforced concrete box culverts having an invert of 735.68 feet and cast in place headwalls. To facilitate the construction of the headwalls, we understand that full depth pavement replacement is proposed between STA 992+50 to STA 994+51. The reported width (face-to-face of guardrail) of the pavement above the culvert is 42 feet.

Based on further discussions with LJB, we understand that a temporary support of excavation system consisting of soldier pile and lagging is proposed along the centerline of the existing culvert to allow for phased construction.

It has been assumed that the proposed pavement areas will consist of heavy-duty flexible (asphalt) sections. Traffic volumes and loads were not provided.

3.0 GENERAL SITE AND SUBSURFACE CONDITIONS

3.1 General Site Conditions and Geology

The project site is located within the glaciated portion of Ohio, with surface elevation along Ohio Turnpike Ramp Bridge ranging from approximately 748 to 750 feet, as depicted from Google Earth. The surface elevation along the centerline of the creek within the project area ranged from approximately 732 to 735 feet.

Quaternary soil deposits consist of lake planed moraine (Clayey till known as the Hiram Till - L4) soils that are known to be very flat, planed by waves in glacial lakes; small patches of sand, silt, or clay could be encountered at the surface in many areas.

Bedrock at the site consist of the Upper Devonian aged Berea Sandstone and Bedford Shale un-divided formation. These formations consist of interbedded layers of Shale, Siltstone and Sandstone. Top of rock elevation was reported to be at roughly 725 feet, which is anticipated around 25 to 30 feet below existing grades. No Mining has been reported on or near the site.

3.2 Historical Boring Review

Historic roadway borings were performed in the project area along the turnpike at approximately 500 feet spacings and at the foundation of nearby intersecting bridges. The plan and profile drawing, as well as available boring logs for the historic borings, are included in Appendix A of this report. Additionally, the approximate locations of the historic borings with respect to the proposed culvert are shown on the attached Location Plan (Exhibit A).

Based upon a review of the provided historical plan and profiles, it appears that the sandstone bedrock was reported in Historical Borings (HB) #2349 and #2351 at approximate elevation 740.6 and 740.5 feet, respectively. The sandstone layer was overlain by A-6 and A-2-4 soils and the borings were terminated upon refusal over the sandstone bedrock. It should be noted that historical borings are 280-to-380 feet away from the culvert location and the actual logs were missing, this information was depicted from the plan and profile sheet. In addition, we identified the log of HB #2122 located near the southern abutment of the Root Road bridge over the turnpike and roughly 780 feet west of the existing culvert location. Based on the log, the overburden soils appeared to consist of stiff A-2-4 soils having a reported SPT N-Value of 9 blows per foot. Sandstone bedrock was reportedly encountered and cored between elevations 736 and 726 feet. The reported recovery ranged from 60 to 70 percent. The RQD was not provided, however, based on the reported number of pieces (13 to 40 pieces), it appears that the sandstone is of fair quality. For the purpose of design parameters, we have assumed that

the sandstone bedrock has presumptive and conservative unconfined compressive strength of 2,000 psi. However, independent test borings would be required to assess the strength to determine rippability,

Ground water was reportedly encountered at 6 ½ feet below existing grades (corresponding to approximate elev. +/- 762 feet) in HB #2122. Based on draft construction drawings provided from LJB, the normal water elevation is reported at 737.51 feet and the ordinary high water mark at 739.91 feet.

4.0 DESIGN RECOMMENDATIONS

The following conclusions and recommendations are based on our understanding of the proposed construction and on the data obtained from the historic boring information. If the project information or location as outlined is incorrect or should change significantly, a review of these recommendations should be made by TTL. These recommendations are subject to the satisfactory completion of the recommended site and subgrade preparation and fill placement operations described in Section 5.0, “Construction Recommendations”. **It should be noted that our evaluations are based on the provided historic test borings that were performed by others in the general project area. We have assumed that the boring data are correct, and that subsequent construction activities have not resulted in differing conditions.**

4.1 Culvert Support

Based on the provided information, the invert for the proposed culvert is anticipated at Elev. 735.68 feet. Based on the conditions encountered in the historical borings, the bearing materials at the anticipated culvert invert are expected to consist of sandstone bedrock. This layer is considered generally suitable for support of the proposed culvert, using bedding and haunching materials in accordance with ODOT Construction and Material Specifications (CMS) and manufactures guidelines.

If unsuitable bearing materials are encountered at the invert elevations, they should be undercut to the underlying sandstone layer or other competent rock stratum. The undercut zones should be replaced with engineered fill, properly placed and compacted as outlined in Section 5.2 of this report. If saturated soil or groundwater seepage is encountered, we recommend that a coarse, open-graded aggregate be utilized (ODOT Table 703.01-1, No. 57 or No. 67 stone).

Along the proposed culvert alignment, we recommend that the trench excavation at the invert elevation be inspected by a geotechnical engineer or qualified representative. This is to confirm that the culvert bearing materials are consistent with those predicted based on the nearby historic borings, and that the exposed materials are capable of supporting the proposed culvert.

Note that with our recommendation to bear the culvert on bedrock, a test boring drilled in the immediate vicinity of the proposed culvert would provide more reliable and appropriate top-of-rock data as required to properly size the culvert.

4.2 Culvert Installation Method

The sides of the temporary excavations for culvert installation should be adequately sloped to provide stable sides and safe working conditions. Otherwise, the excavation must be properly

braced against lateral movements. In any case, applicable Occupational Safety and Health Administration (OSHA) standards must be followed. It is the responsibility of the installation contractor to develop appropriate installation methods and specify pertinent equipment prior to commencement of work, and to obtain the services of a geotechnical engineer to design or approve sloped or benched excavations and/or lateral bracing systems as required by OSHA criteria.

Although the bearing materials and anticipated “normal” groundwater level below the culvert invert should be generally conducive to stable excavation slopes, provisions should be made for the culvert installation to proceed as a sloped-bank excavation, or as a steeper trench-type cut with properly designed and installed lateral bracing. The latter system may include the use of a portable trench box or a sliding trench shield.

If the excavation is to be performed with sloped banks, adequate stable slopes must be provided in accordance with OSHA criteria. Due to the lack of a specific subsurface investigation, OSHA type C soils should be assumed for the backslopes side slopes must be constructed no steeper than 1½ horizontal to 1 vertical (1½H:1V). it should be noted that flatter slopes may be required if lower strength soils or adverse seepage conditions are encountered during construction.

A cofferdam or conveyance system should be considered to maintain ditch flow around the project area during construction. Sheet piling or cofferdam excavation support should be considered for culvert and headwall foundation installation below ditch bottom. Design of sheet-pile cutoff walls or cofferdams should be the responsibility of the contractor, since their installation and performance is integrally tied to the contractors means and methods of construction. In addition, OSHA requires that excavations with open-cut slopes higher than 20 feet, or braced excavation support systems such as sheetpiling or cofferdams, be reviewed and designed by a registered professional engineer.

Regardless of the final excavation support scheme, the contractor must take appropriate measures to stabilize the excavation and prevent vertical or lateral movements of the existing grade, utilities, nearby structures, etc. All excavations should be conducted in accordance with OSHA requirements.

4.2.1 Temporary Support of Excavation

As mentioned above, in order to maintain vehicular during construction, a temporary support of excavation (TSOE) is proposed along the centerline of the existing ramp. A TSOE system

will provide support to the excavation sides; avoid loss of ground from under pavement, and neighboring landscaped areas; and provide stability to the excavated soil face. At this time, we anticipate that soldier piles and timber lagging can be used to provide temporary support of excavation. Although not anticipated to be prevalent, lateral bracing (e.g. ground anchors, steel rakers, etc.) may be required to restrain deeper TSOE systems. Site-specific TSOE system designs and drawings should be prepared by the Excavation Contractor's Professional Engineer, licensed in Ohio, and should account for surcharge loads, construction loads, adjacent foundations, and hydrostatic loads in the design.

We anticipate that the soldier pile will consist of drilled shafts bearing in the sandstone layer that was identified based on the historic borings, and backfilled with grout slurry. For a drilled shaft foundation with a depth to diameter ratio of at least 1.5, we recommend an allowable end-bearing pressure of 6,000 pounds per square foot (psf). If weathered/fractured rock is present the drilled shaft should extend through this material to intact bedrock.

For lateral capacity of drilled shaft foundations, we recommend an allowable lateral earth pressure of 400 pounds per square foot (psf) per foot of depth, with a limiting value of 3,600 psf. The allowable lateral pressure becomes constant and does not increase linearly beyond the depth associated with the limiting value. We further recommend that the lateral pressure be neglected from the ground surface to a depth of 3 feet due to the potential for volume change and shrinkage resulting from moisture variation and freeze-thaw behavior. It is anticipated that the bearing depth of the drilled shaft foundation may be governed by the required lateral capacity.

We do not recommend diameters less than 30 inches for drilled shafts. Settlement of foundations bearing on bedrock is expected to be negligible. It should be noted that the actual capacity of drilled shafts is dependent on proper installation methods, and the allowable capacity is based on the assumption that a reasonable standard of care and quality control will be exercised during drilled shaft installation.

Based on the shallow bedrock encountered in the historic borings, drilled shaft installation even below the groundwater table is expected to experience only minor weeping unless zones or weathered/fractured rock are encountered. Temporary steel casing may be required in order to support the shaft walls, as well as seal out water seepage prior to concrete placement. The drilled shafts should be clean and free of all loose material prior to the placement of concrete or grout slurry. A TTL representative should verify that the installation procedures meet specifications.

If tremie methods are utilized for concrete placement, sufficient concrete should be maintained above the bottom of the casing as the steel casing is withdrawn to counteract any hydrostatic head and prevent collapse or “necking” of the shaft. Care must be taken during concreting and removal of any temporary casing to prevent the possibility of soil intrusions.

Although cobbles and/or boulders were not encountered in the provided historic borings, they are common in glacial till soils, such as those present at this site. Should obstructions or auger refusal occur prior to reaching planned bearing depths, cobbles, boulders, or large obstructions may be indicated. Provisions must be made to remove any cobbles, boulders, or large obstructions encountered during the drilling operations.

We recommend that the drilled shafts be concreted as soon as practical after they are excavated and that water not be allowed to pond in any excavation. If it is necessary to leave the bearing surface open for any extended period of time, we recommend that a thin mat of lean concrete be placed over the bottom of the excavation to reduce damage to the surface from weather or construction. Foundation concrete should not be placed on saturated subgrade.

4.3 Headwall Foundations

Based on the provided information, headwall foundations for this project may bear at approximately Elev. 731 to 733 feet. It should be noted that the minimum required depth for protection from frost penetration is to bear on competent bedrock or 3½ feet below the adjacent exterior grades at the project site. Depending on final grading, it may be necessary to extend the bottom of the headwall footings. Following the satisfactory completion of the site preparation operations outlined in Section 5.0 of this report, it is recommended that the proposed headwall be supported on shallow foundation systems bearing on engineered fill or sandstone bedrock with a net allowable bearing pressure of 2,000 pounds per square feet (psf). Total settlement of the foundation bearing on sandstone bedrock should be roughly ½ inch or less.

Based on the conditions encountered in the historic borings, the materials at the anticipated headwall foundation bearing elevation are expected to consist of sandstone bedrock . This layer is presumptively considered suitable for support of the proposed headwall foundations. However, if unsuitable bearing materials are encountered at the foundation bearing elevation, they will require undercut to the underlying sandstone layer or other competent rock stratum. The undercut zones should be replaced with engineered fill, properly placed and compacted as outlined in Section 5.2 of this report. If saturated soil or groundwater seepage is encountered,

we recommend that a coarse, open-graded aggregate be utilized (ODOT Table 703.01-1, No. 57 or No. 67 stone). The base of the over-excavation should be widened one foot for every foot of depth and centered along the footing. Alternatively, the over-excavated areas could be backfilled with lean concrete having a minimum compressive strength of 1,500 pounds per square inch (psi) or other flowable controlled-density fill having a minimum compressive strength of 100 psi. If foundations will be placed at the base of the over-excavation or the lean concrete fill option will be utilized, widening the footing over-excavation will not be required. If the controlled-density fill option is utilized, the footing over-excavation shall be widened as discussed above.

For headwalls that are not restrained at the top of the wall, lateral earth pressures should be assumed for active conditions. It is anticipated that excavated on-site cohesive soils will comprise the majority of the backfill behind the new walls. For the cohesive soils, an active earth pressure coefficient (k_a) of 0.44 should be used in determining the lateral pressure acting on the walls, along with a total (moist) soil unit weight of 125 pounds per cubic foot (pcf). Alternatively, an equivalent fluid weight of 55 pcf may be used for the active case design.

If lower at-rest earth pressures are preferred for structural reasons or to improve overturning/sliding stability, we recommend that a select, free-draining granular fill (such as No. 57 or 67 stone) be utilized for the headwall backfill zone. For these granular fill types, k_a may be taken as 0.25, and the soil unit weight may be assumed as 120 pcf. Alternatively, an equivalent fluid weight of 30 pcf may be used for these granular fills.

Lateral load due to hydrostatic pressures below the design groundwater depth should be included in design of below-grade walls. Additionally, the earth pressures indicated above are based on a level backfill condition behind the headwall. However, due to the roadway grade above the culvert, there may be sloping backfill behind the top of the wall. If this is the case, surcharge loading or equivalent higher earth pressure coefficients should be evaluated, based on backfill material, backfill slope, and proximity to the wall. In general, 50 percent of the vertical surcharge load may be assumed for lateral loading in the design of the wall.

Headwall footings should also be checked for sliding stability. We recommend that passive pressure be considered negligible at the toe of the wall due to the potential for erosion and/or freeze-thaw behavior that would significantly reduce reliance on passive earth pressure. A friction parameter of 0.55 could be used to determine the slide resistance between footing and bearing surface.

We recommend all slopes on the toe side of the wall have erosion protection, such as vegetated topsoil, riprap, and/or man-made materials. Seeding of the exterior slopes should be completed as soon as possible after construction is complete.

4.4 Groundwater Control and Drainage

Encountered groundwater conditions noted on the historical borings were previously discussed in Section 3.2.

It is our experience that adequate control of groundwater seepage or surface water run-off into shallow excavations should be achievable by minor dewatering systems, such as pumping from prepared sumps. If excavation extends below the groundwater table in granular soils, installation of multiple point wells will be required in addition to pumping from prepared sumps. In the event excessive seepage is encountered during construction, TTL may be notified to evaluate whether other dewatering methods are required.

5.7 Excavations and Slopes

As mentioned previously, the sides of temporary excavations for construction should be adequately sloped to provide stable sides and safe working conditions. Recommendations were provided in Section 5.3.2 for sloping of temporary excavations.

For permanent excavations and slopes, we recommend that grades generally be no steeper than 3H:1V. It should be noted that the OTIC routinely uses 2H:1V slopes for roadway embankments and spill-through sections. While these steeper slopes may be used, it is our experience that the embankment faces are more prone to erosion and sloughing.

4.5 Flexible (Asphalt) Pavement Design

We understand the subgrade of the proposed added lanes will consist of properly compacted engineered fill. Based on our experience with similar soils, and on the results of the plasticity and gradation testing for the upper profile cohesive subgrade soil samples, we recommend a subgrade CBR value of 4 percent. This CBR value is based on subgrade soils that are placed and compacted in accordance with ODOT Item #203.

All paving operations should conform to the Ohio Turnpike Commission and the Ohio Department of Transportation (ODOT) specifications. The pavement and subgrade preparation procedures outlined in this report should result in a reasonably workable and satisfactory pavement. It should be recognized, however, that all flexible pavements need repairs or

overlays from time to time as a result of progressive yielding under repeated traffic loads for a prolonged period of time, as well as exposure to freeze-thaw conditions.

5.0 CONSTRUCTION RECOMMENDATIONS

5.1 Site and Subgrade Preparation

In planning the implementation of earthwork operations, special consideration should be given to provide measures to prevent or reduce soil erosion and the subsequent sedimentation into nearby waterways. These measures may include some or all of the following:

1. Scheduling of earthwork operations such that erodible areas are kept as small as possible and are exposed for the shortest possible time.
2. Using special grading practices, along with diversion or interceptor structures, to reduce the amount of run-off water from an erodible area.
3. Providing vegetative buffer zones, filter berms, or sedimentation basins to trap sediment from surface run-off water.

A specific and detailed soil erosion and sedimentation control program and permits may be required by local, state, or federal regulatory agencies.

Site and subgrade preparation activities should conform to ODOT Construction and Materials Specifications (CMS) Item 204 specifications. Site preparation activities should include the removal of vegetation, topsoil, root mats, pavements, and other deleterious non-soil materials from all proposed roadway areas. The actual amount of required stripping should be determined in the field by a geotechnical engineer or qualified representative.

Upon completion of the clearing and undercutting activities, all areas that are to receive fill, or that have been excavated to proposed final subgrade elevation, should be inspected by a geotechnical engineer. Pavement subgrades should be proof rolled in accordance with ODOT CMS 204.06.

Any unsuitable materials observed during the inspection and proof-rolling operations should be undercut and replaced with compacted fill, or stabilized in place utilizing conventional remedial measures such as discing, aeration, and recompaction. As stated previously, based on the conditions encountered during our exploration, where subgrade soil moisture contents were wet of optimum, they were significantly wet of optimum. Scarification and aeration methods may be utilized in areas where subgrades wet of optimum are present, provided weather conditions and construction schedule will allow such soil modification.

5.2 Fill

Material for engineered fill or backfill required to achieve design grades should meet ODOT Item 203 “Embankment Fill” placement and compaction requirements. In general, suitable fills may consist of any non-organic soils having a maximum dry density of 100 pounds per cubic foot (pcf) or greater as determined by the One Point Proctor method (ODOT Supplement 1015) of. On-site soils may be used as engineered fill materials provided that they are free of organic matter, debris, excessive moisture, and rock or stone fragments larger than 3 inches in diameter. Depending on seasonal conditions, the on-site soils may be wet of optimum and may require scarification and aeration to achieve satisfactory compaction. If the construction schedule does not allow for scarification and aeration activities, it may be more practical or economical to utilize imported granular fill.

Fill should be placed in uniform layers not more than 8 inches thick (loose measure) and adequately keyed into stripped and scarified soils. All fill placed within pavement areas should be compacted to a dry density consistent with the requirements of ODOT Item 203.

The on-site soils consist of granular and cohesive soils. For the cohesive soils, a sheepsfoot roller should provide the most effective soil compaction. For granular soils, granular fill, or dense-graded aggregate pavement base materials, a vibratory smooth-drum roller would be required to provide effective compaction.

Scarified subgrade soils and all fill material should be within 3 percent of the optimum moisture content to facilitate compaction. Furthermore, fill material should not be frozen or placed on a frozen base. It is recommended that all earthwork and site preparation activities be conducted under adequate specifications and properly monitored in the field by a qualified geotechnical testing firm.

5.3 Foundation Excavations

Foundations used to support the proposed culvert structure should have a detailed footing inspection performed for each foundation. A geotechnical engineer or qualified representative should perform these inspections to verify that the exposed materials are similar to those encountered in the historical borings and that engineered fill has been properly placed and compacted such that it is capable of supporting the design bearing pressure.

We recommend that the foundation excavations be concreted as soon as practical after they are excavated and that water not be allowed to pond in any excavation. If it is necessary to leave

the bearing surface open for any extended period of time, we recommend that a thin mat of lean concrete be placed over the bottom of the excavation to reduce damage to the surface from weather or construction. Foundation concrete should not be placed on frozen or saturated subgrade.

Additional foundation subgrade inspection and preparation recommendations are provided in Sections 4.1 and 4.3.

6.0 QUALIFICATION OF RECOMMENDATIONS

Our evaluation of foundation and pavement design and construction conditions has been based on our understanding of the site and project information and the data obtained from the provided historic borings. The general subsurface conditions were based on interpretation of subsurface data obtained at specific boring locations. **It should be noted that our evaluations are based on the provided historic test borings that were performed by others in the general project area. We have assumed that the boring data are correct, and that subsequent construction activities have not resulted in differing conditions.** Regardless of the thoroughness of a subsurface investigation, there is the possibility that conditions between borings will differ from those at the boring locations, that conditions are not as anticipated by the designers, or that the construction process has altered the soil conditions. Therefore, experienced geotechnical engineers should observe earthwork and foundation construction to confirm that the conditions anticipated in design are noted. Otherwise, TTL assumes no responsibility for construction compliance with the design concepts, specifications, or recommendations.

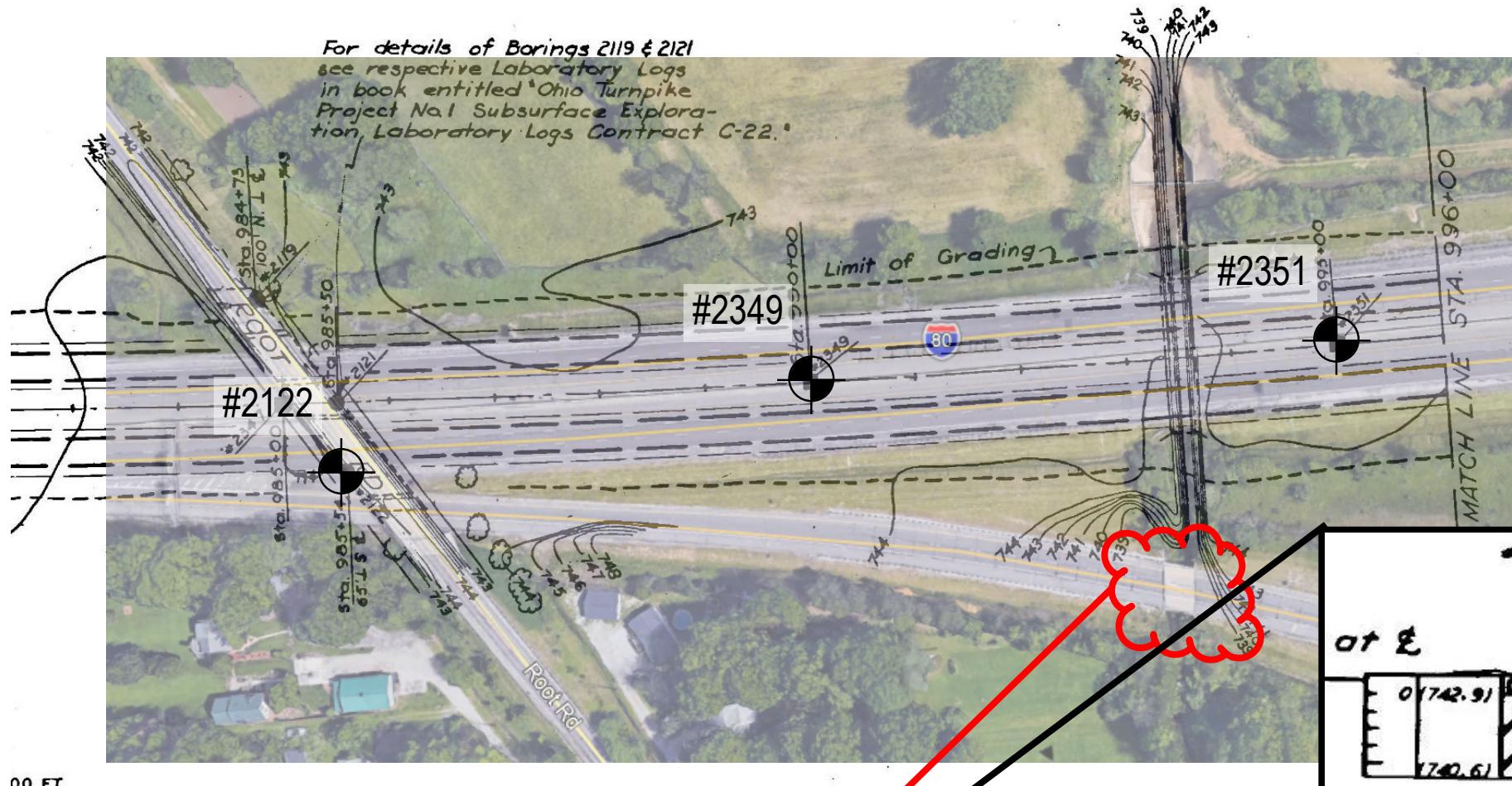
The design recommendations in this report have been developed on the basis of the previously described project characteristics and subsurface conditions. If project criteria or locations change, a qualified geotechnical engineer should be permitted to determine whether the recommendations must be modified. The findings of such a review will be presented in a supplemental report.

The nature and extent of variations between the borings may not become evident until the course of construction. If such variations are encountered, it will be necessary to reevaluate the recommendations of this report after on-site observations of the conditions.

Our professional services have been performed, our findings derived, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties either expressed or implied. TTL is not responsible for the conclusions, opinions, or recommendations of others based on this data.

Exhibit A Location Plan

For details of Borings 2119 & 2121
see respective Laboratory Logs
in book entitled "Ohio Turnpike
Project No 1 Subsurface Explora-
tion, Laboratory Logs Contract C-22."

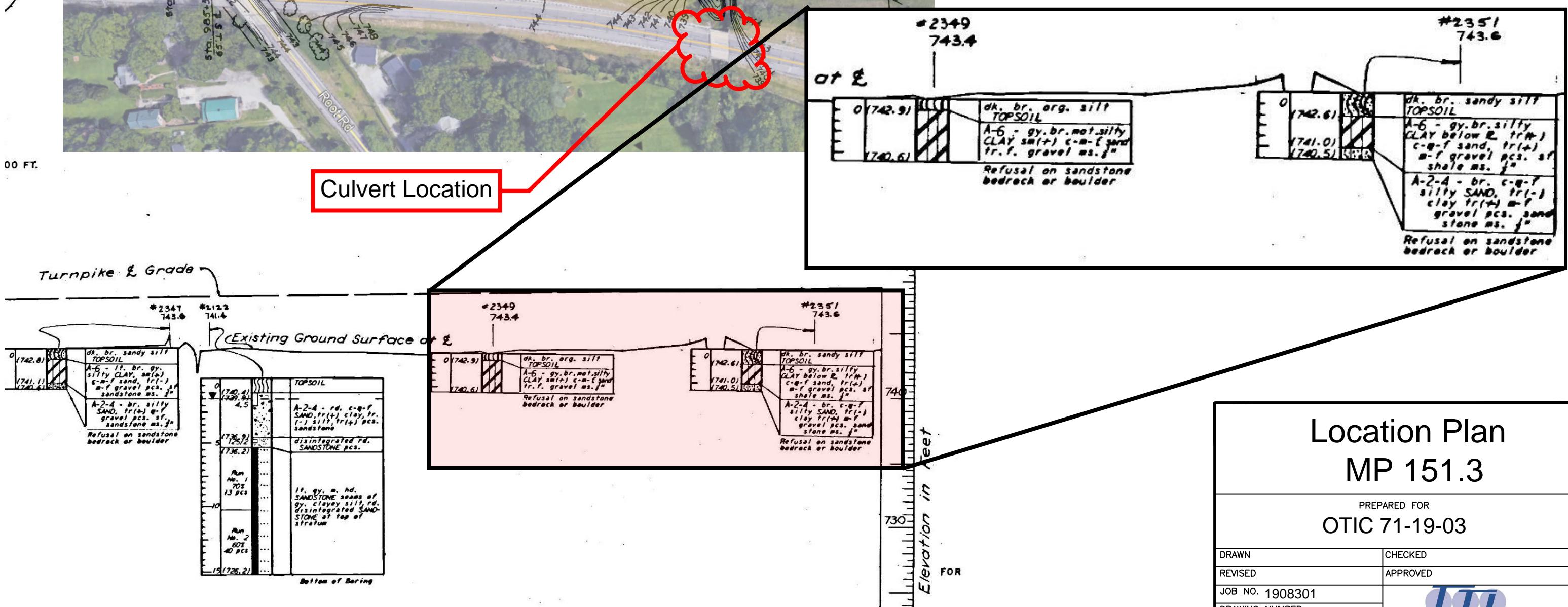
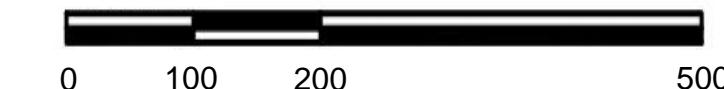


Legend

#2122



– Historical Boring Location



Location Plan

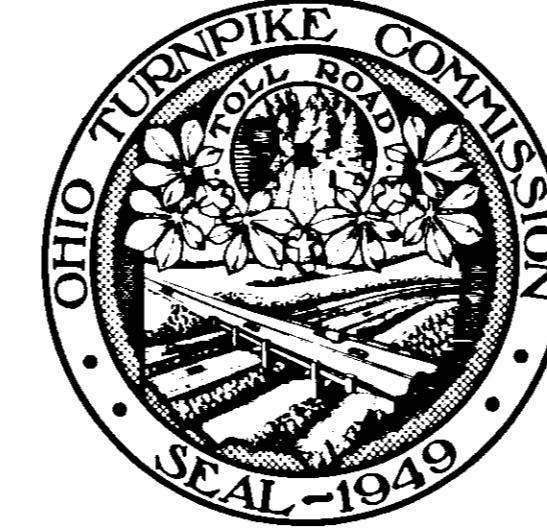
MP 151.3

PREPARED FOR
TIC 71-19-03

| | |
|-----------------|----------|
| DRAWN | CHECKED |
| REVISED | APPROVED |
| JOB NO. 1908301 | |
| DRAWING NUMBER | |
| Exhibit A | |

APPENDIX A

Historic Boring Logs
&
Plan and Profile Sheets



CONTRACT NO. C-22
COUNTY - LORAIN
DATE: APRIL 24, 1953

OHIO TURNPIKE COMMISSION

OHIO TURNPIKE PROJECT NO. 1

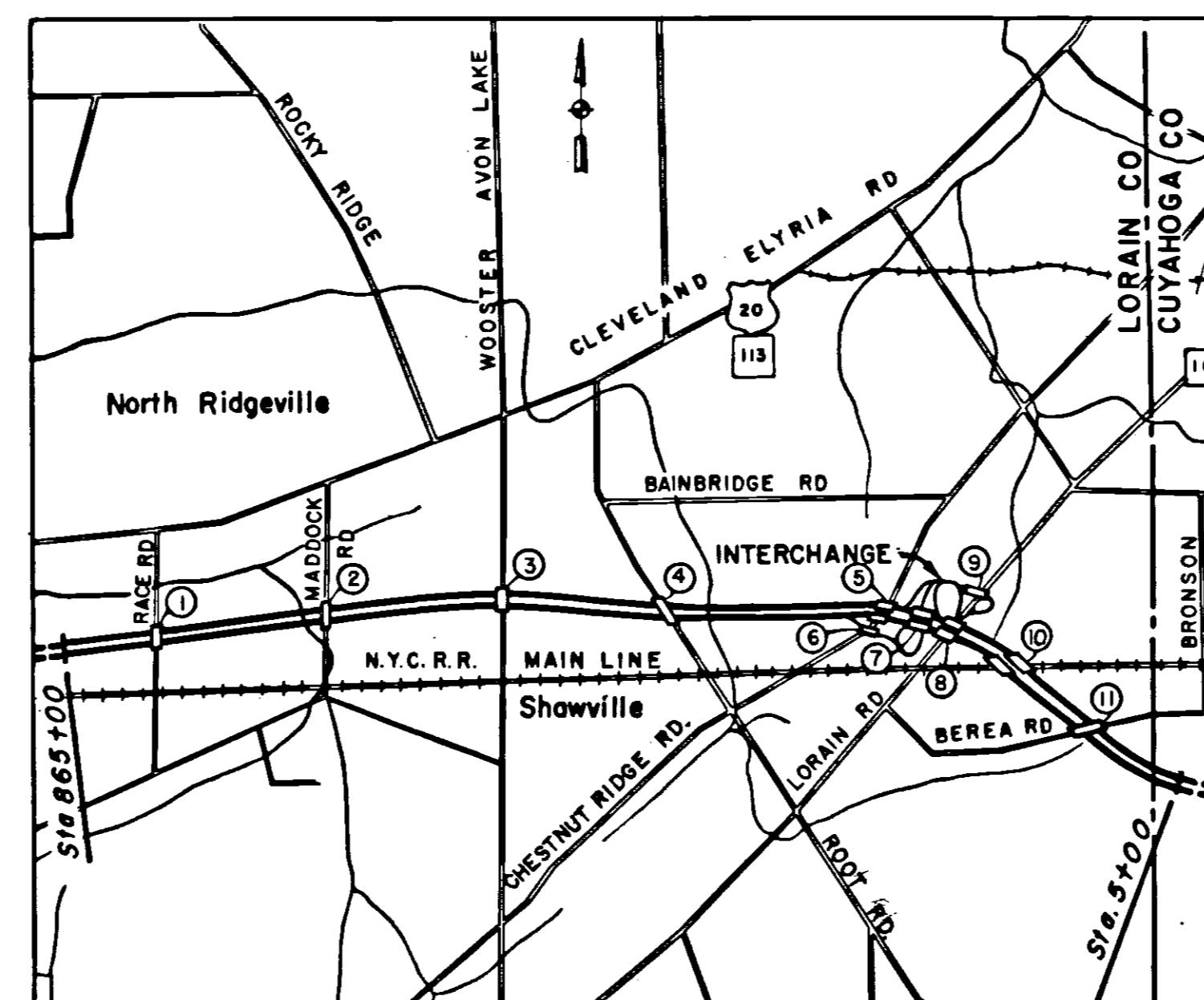
DESIGN SECTION D-7

CONTRACT NO. C-22

TURNPIKE CONSTRUCTION CONTRACT

STATION 865+00 TO STATION 5+00

MASTER SOIL PROFILE



LOCATION PLAN

UNITED STATES GEOLOGICAL SURVEY QUADS

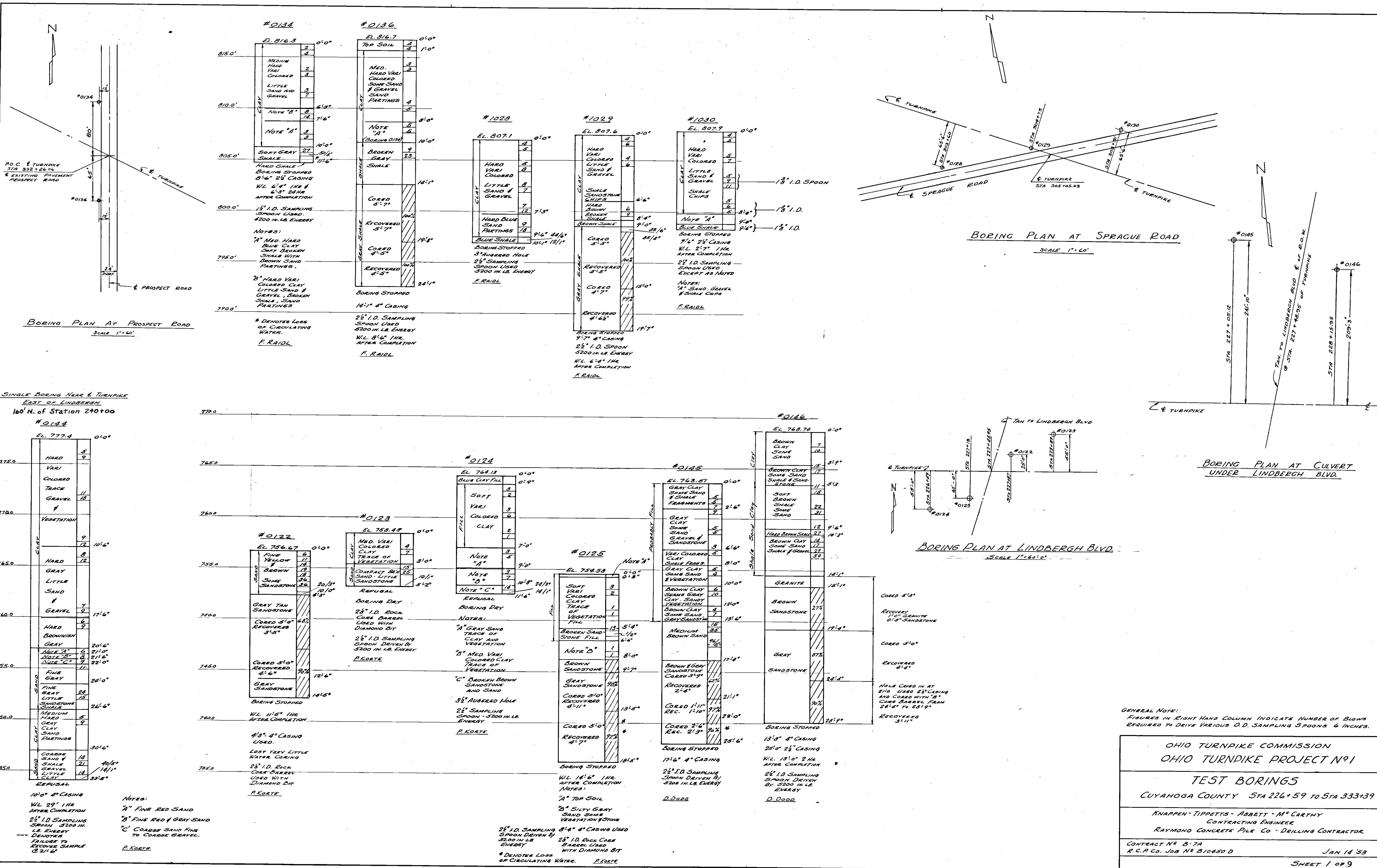
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SCALE IN MILES

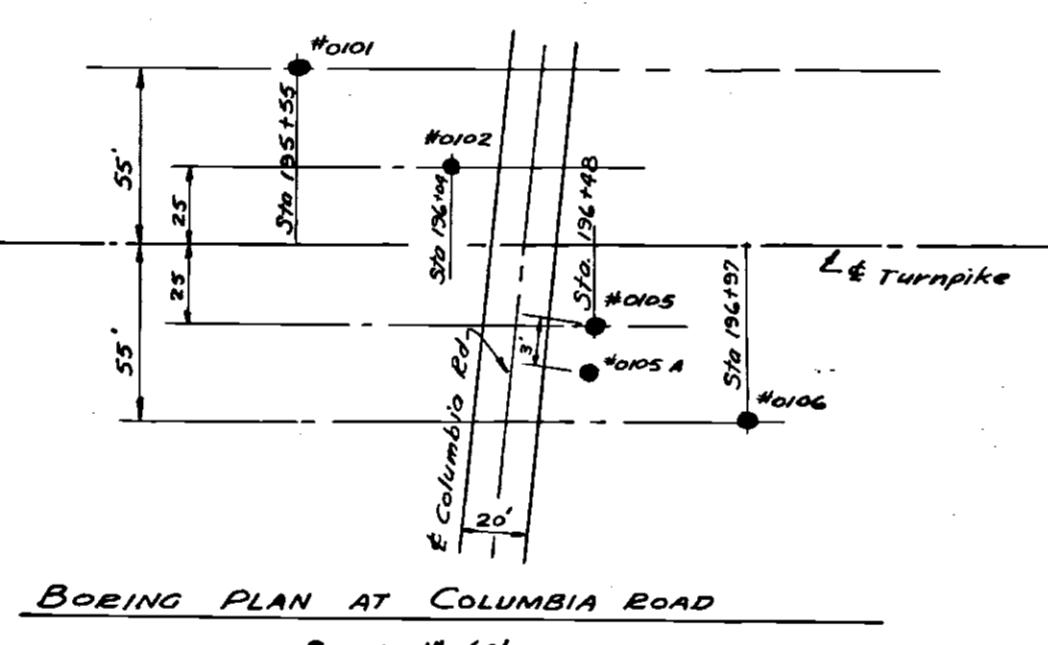
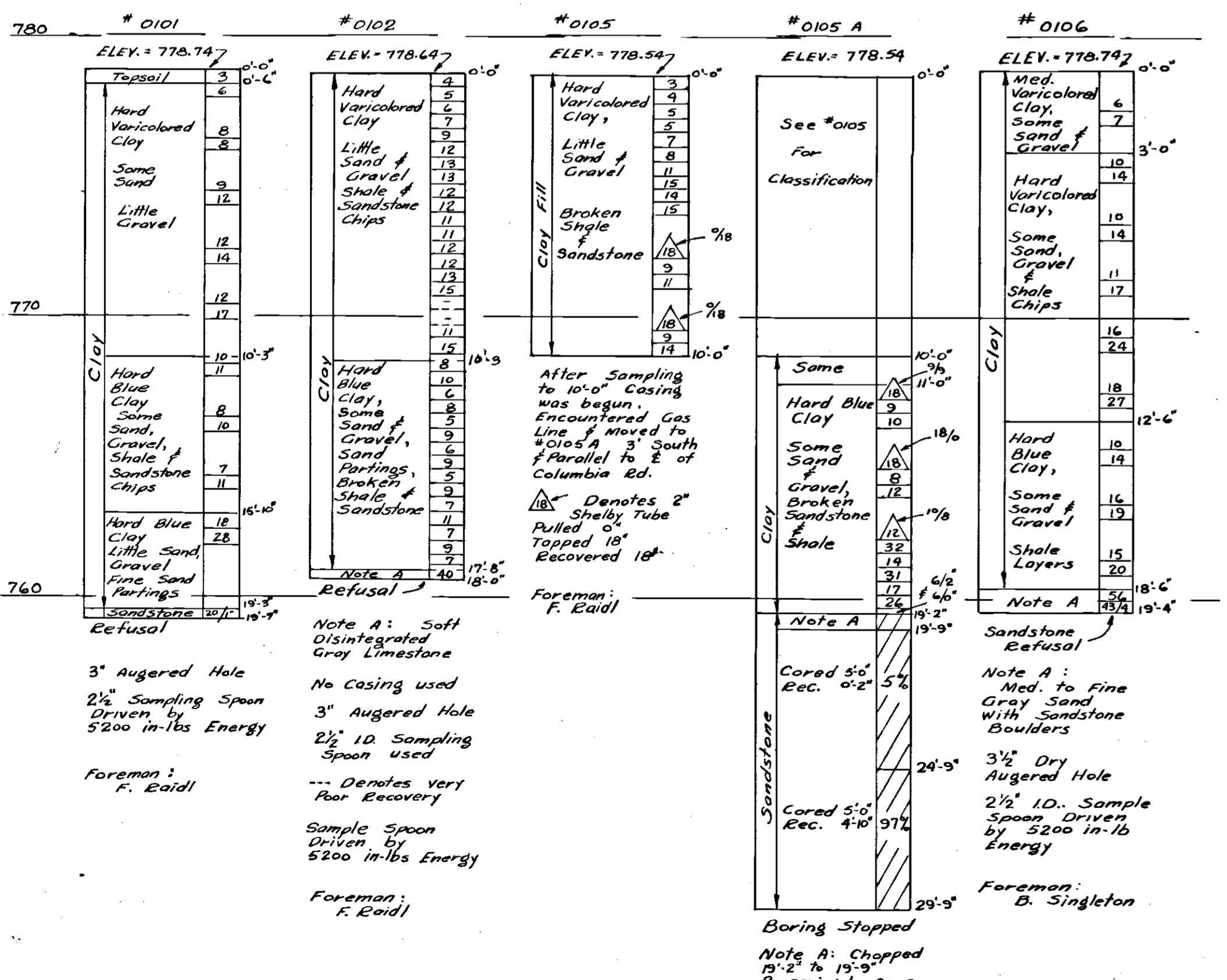
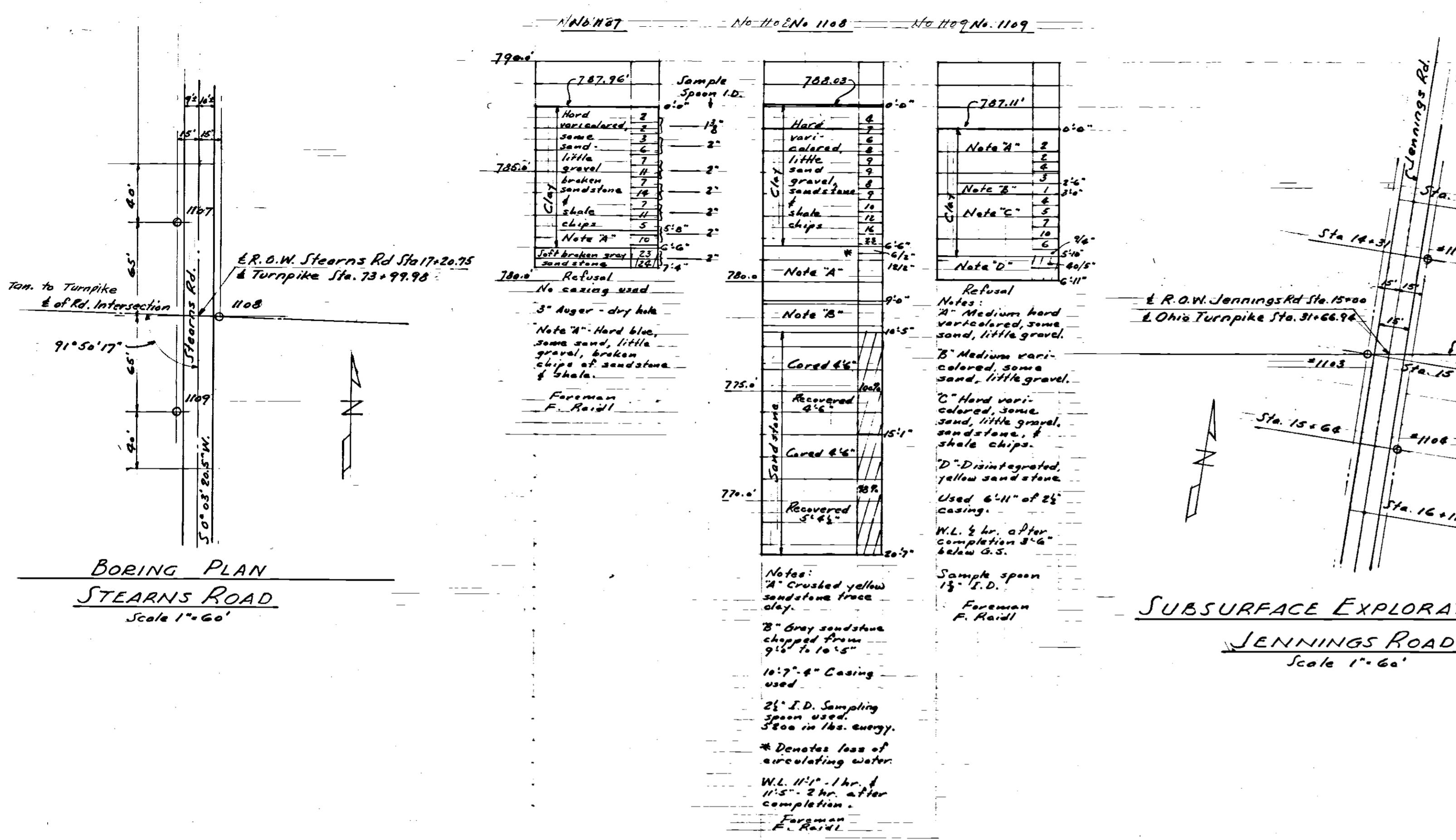
APPROVAL RECOMMENDED
KNAPPEN · TIPPETTS · ABBETT · McCARTHY
CONTRACTING ENGINEER

APPROVED
J. E. GREINER CO.
CONSULTING ENGINEER

APPROVED
OHIO TURNPIKE COMMISSION

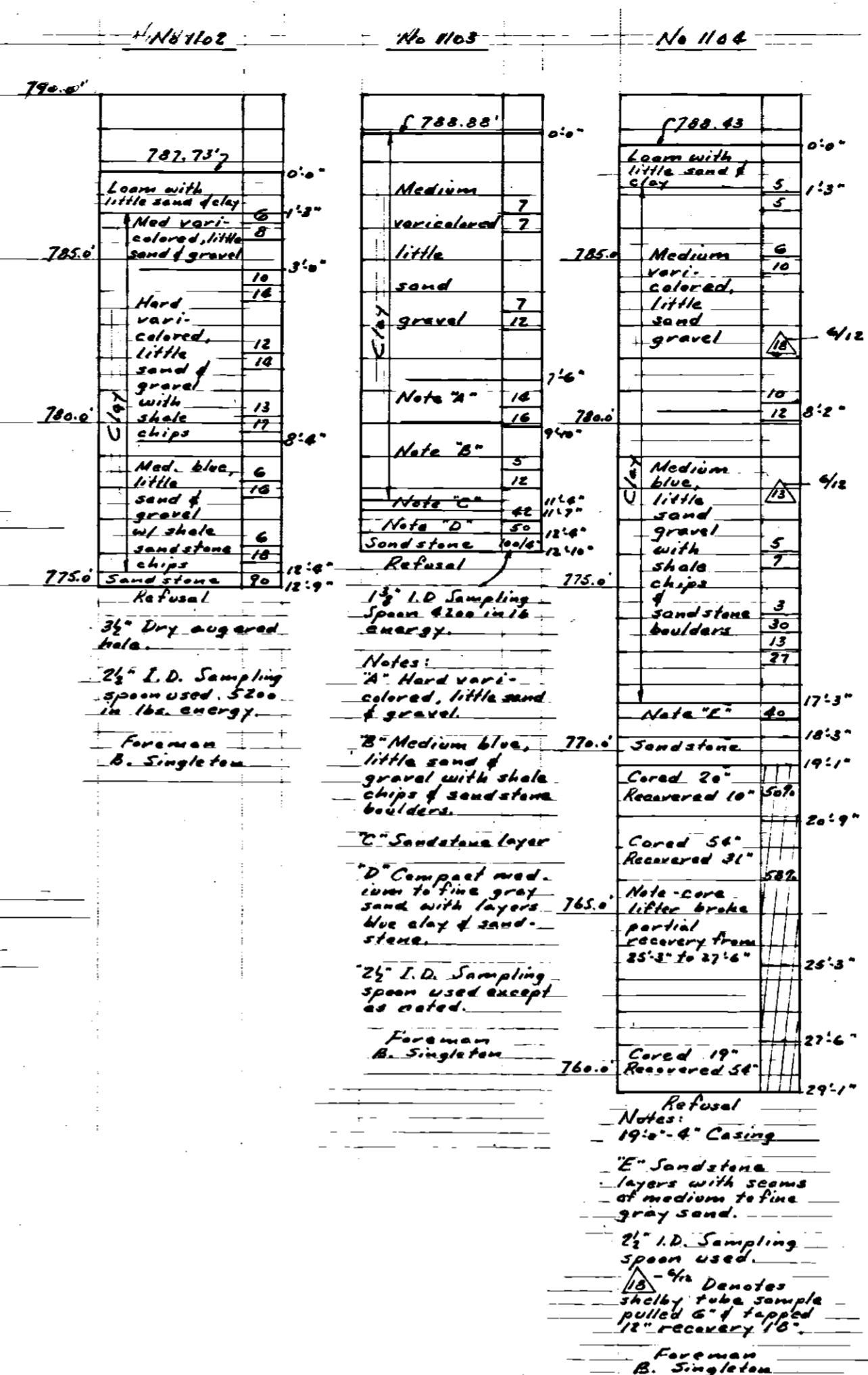
CHIEF ENGINEER





BOEING PLAN AT COLUMBIA RO

SCALE 1



General Note: Figures in right-hand column indicate number of blows required to drive various O. D. sampling spouts 6 inches.

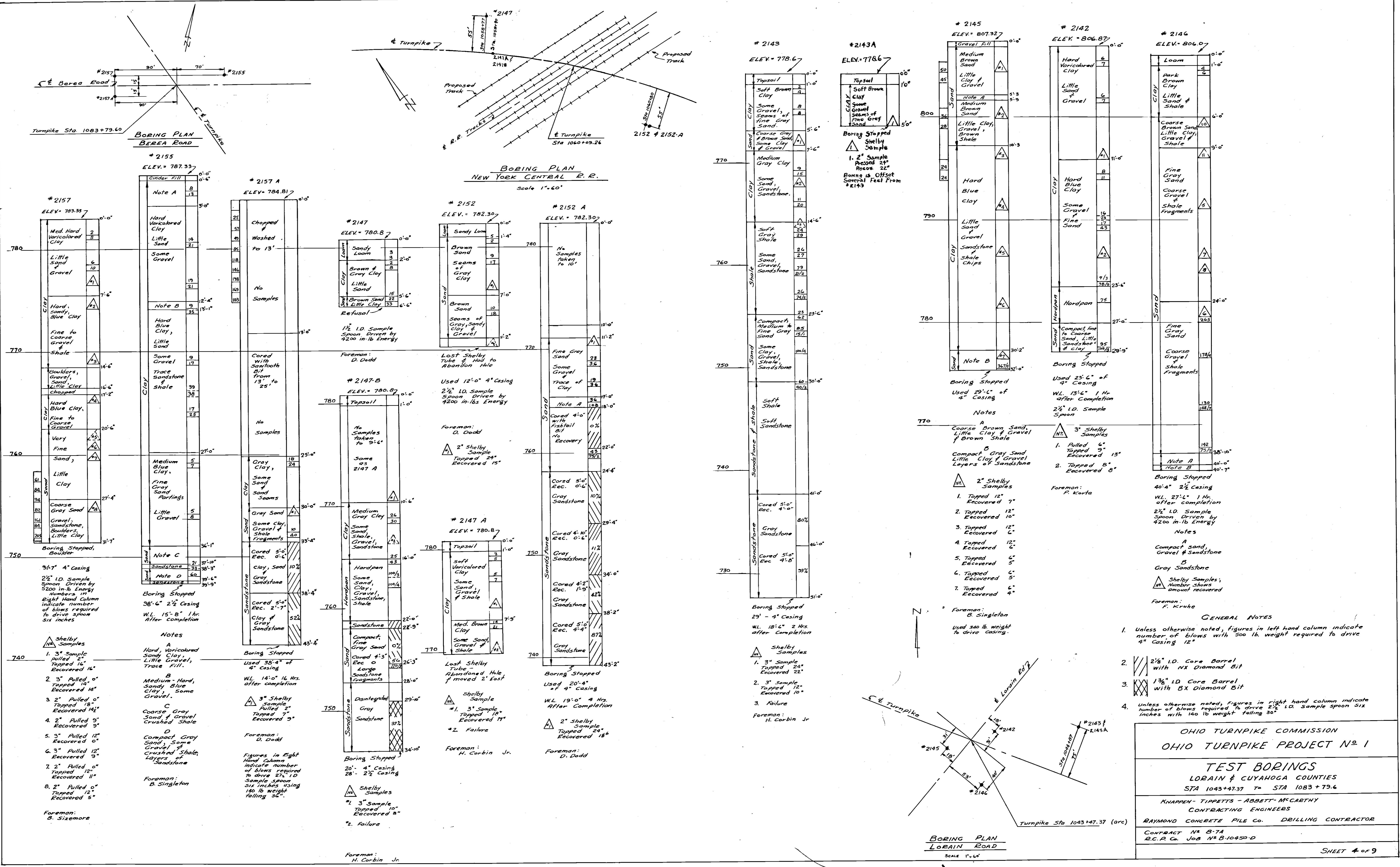
© 2010 Pearson Education, Inc.

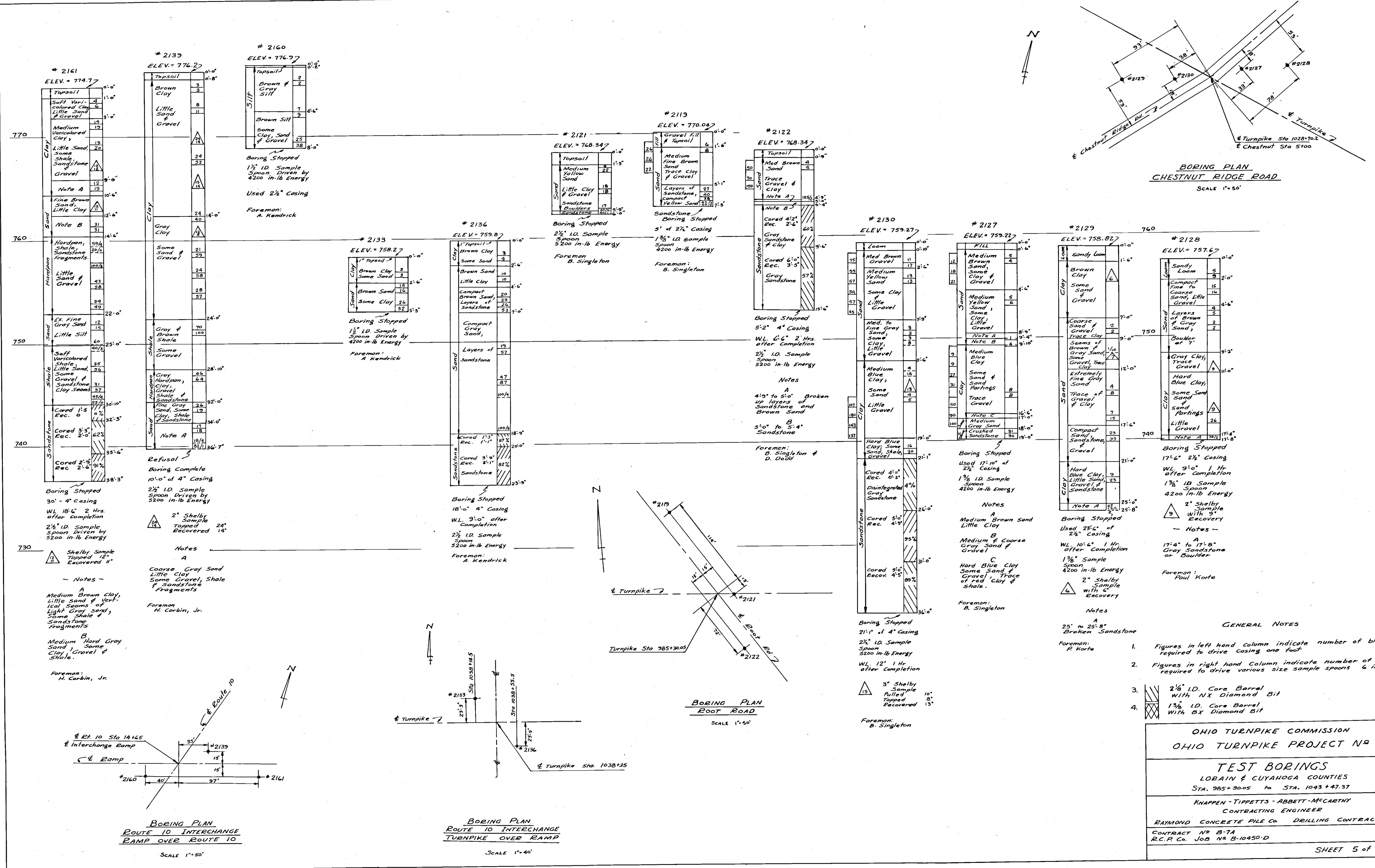
— NEW BOOKS —

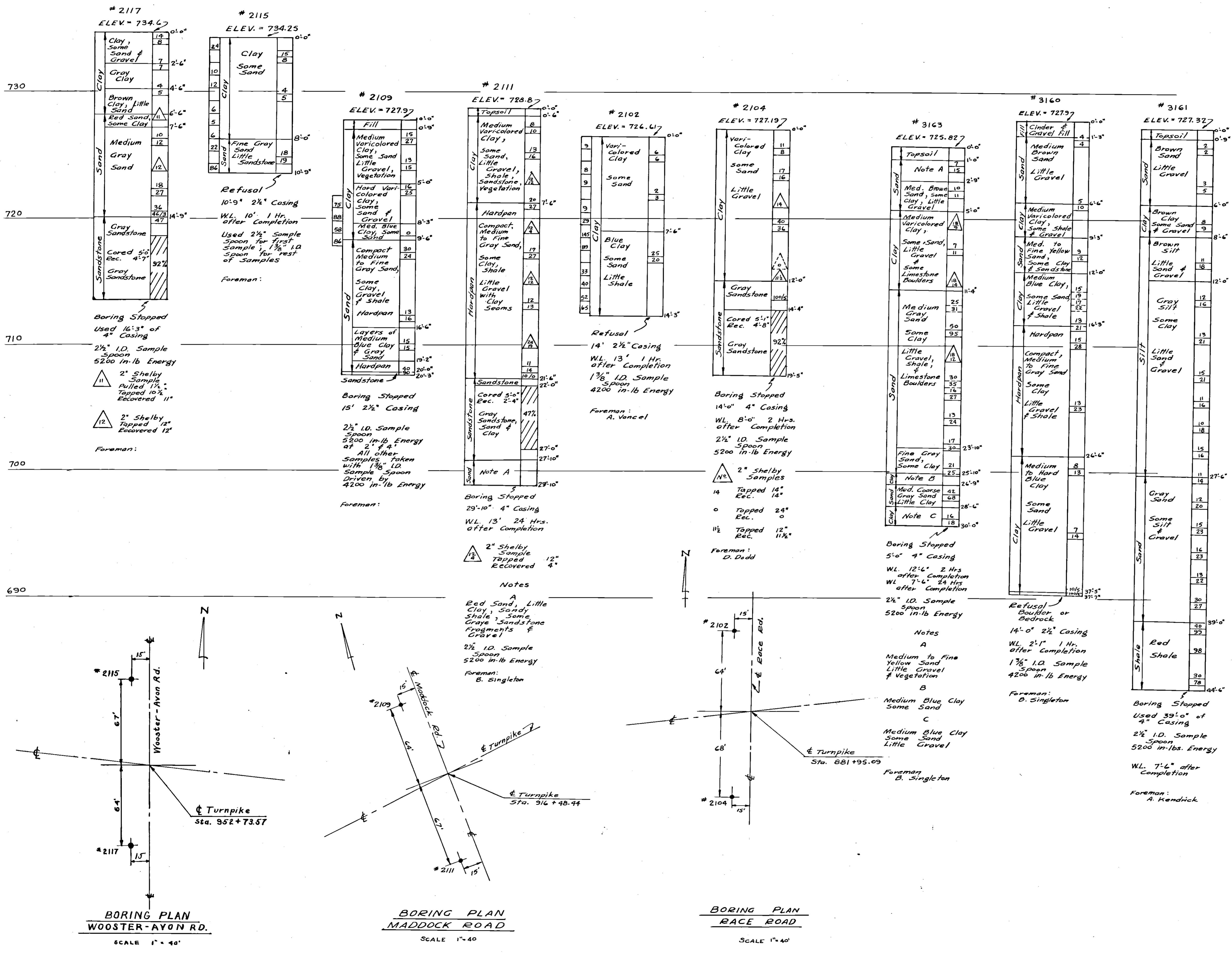
KNAPPEN - TIPPETTS - ABBETT - McCARTHY
CONTRACTING ENGINEER

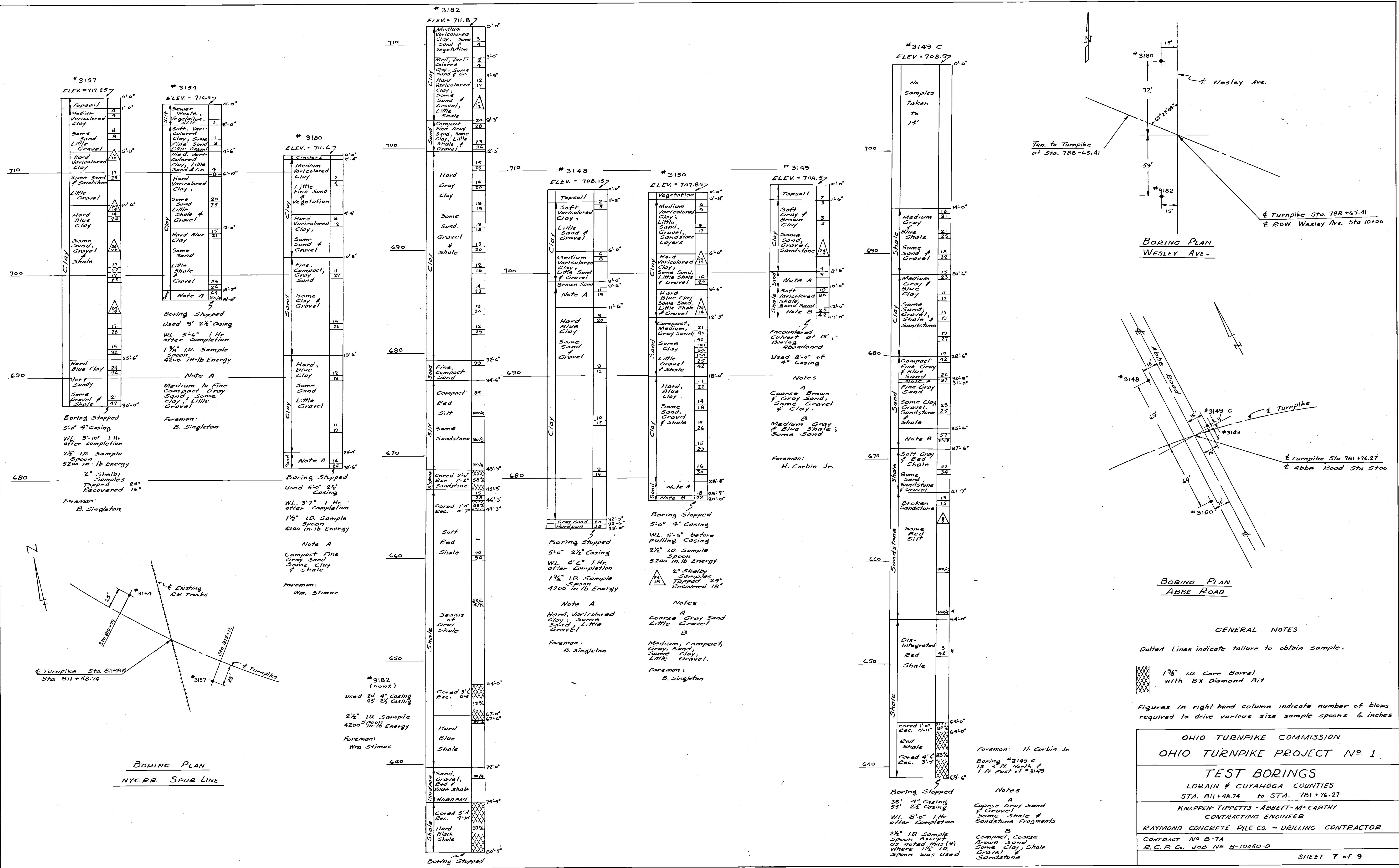
ACT N° B-7A
CA Job N° B 10450 D JAN 14 '53

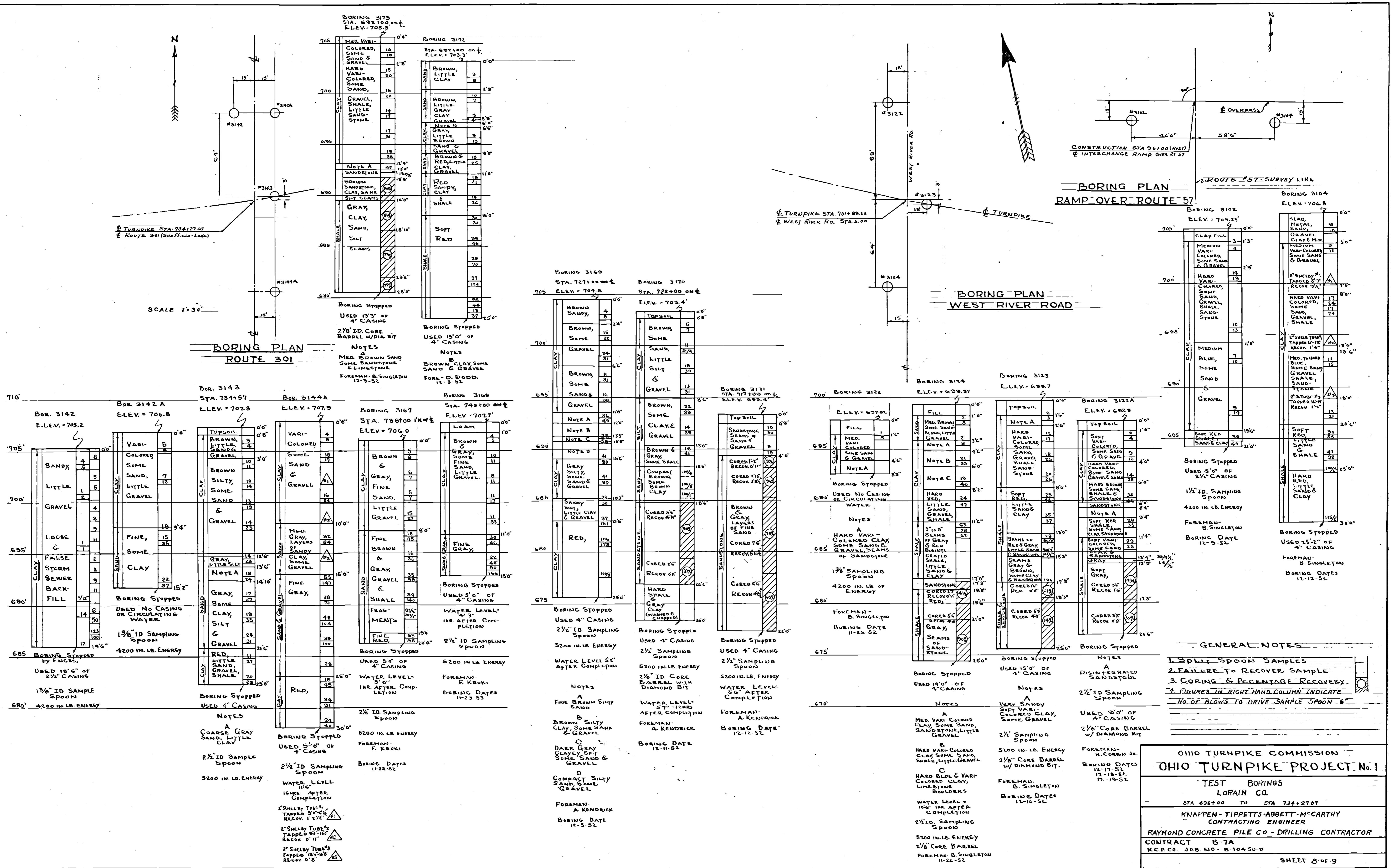
SHEET 3 OF 9

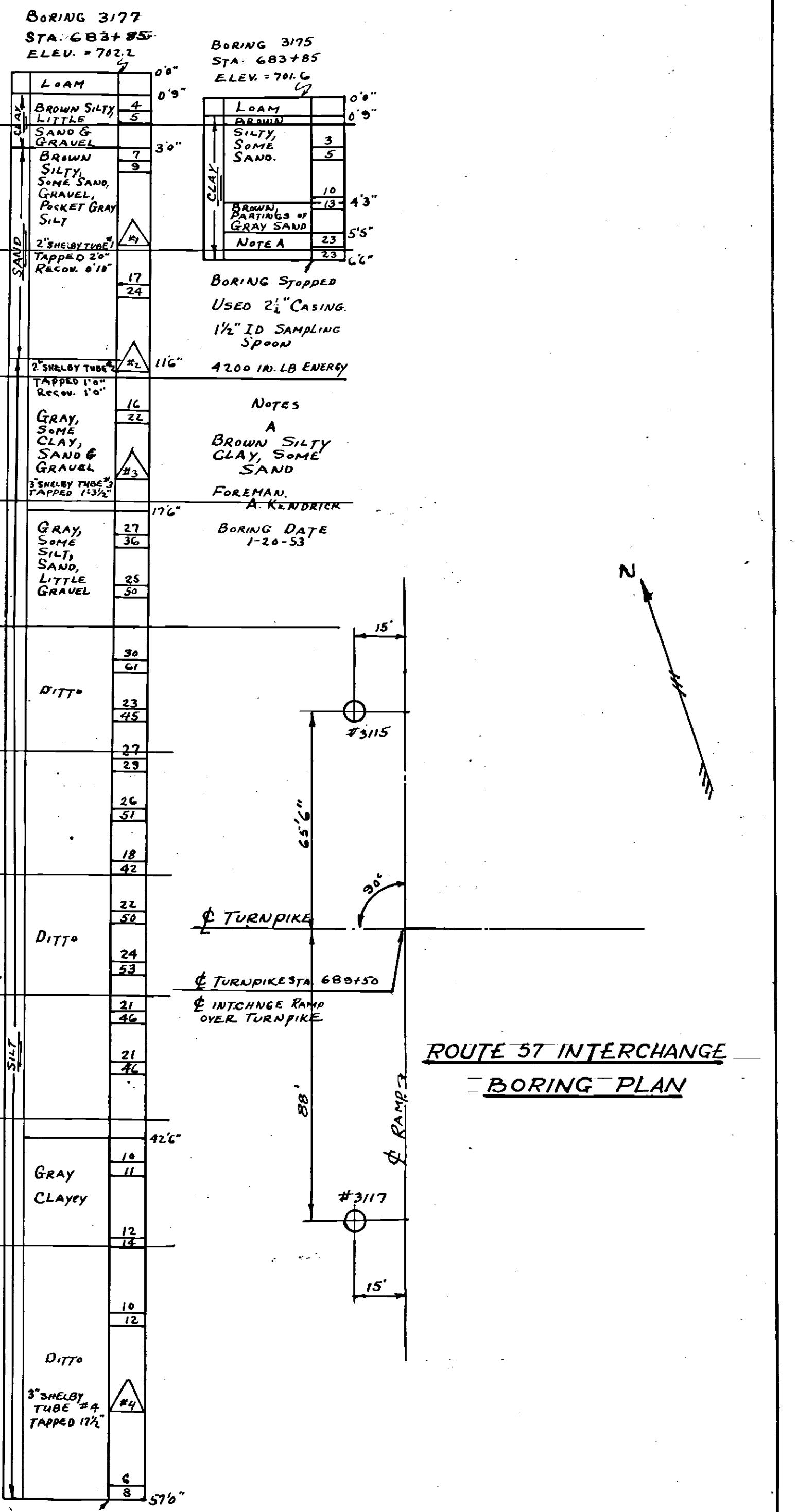
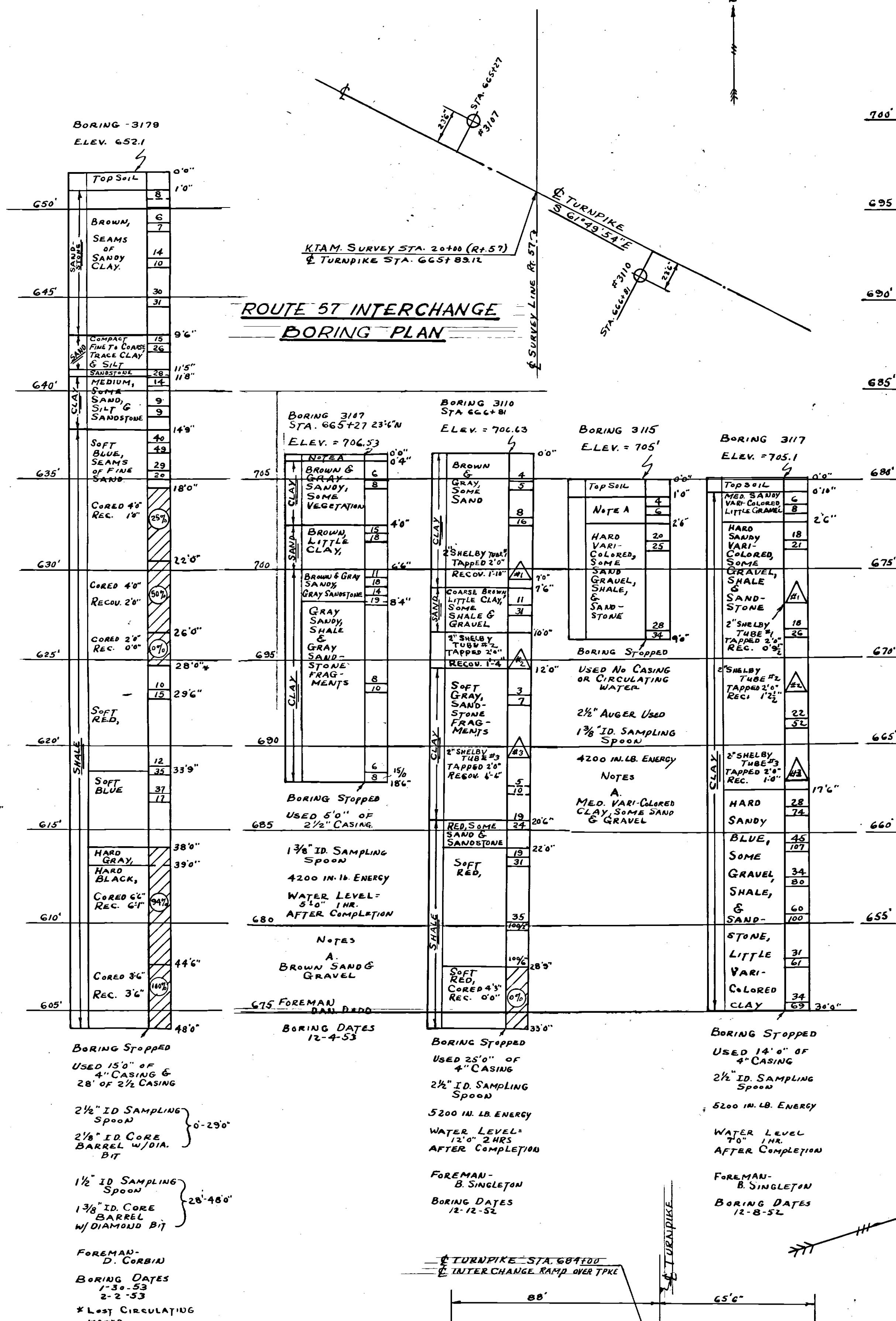
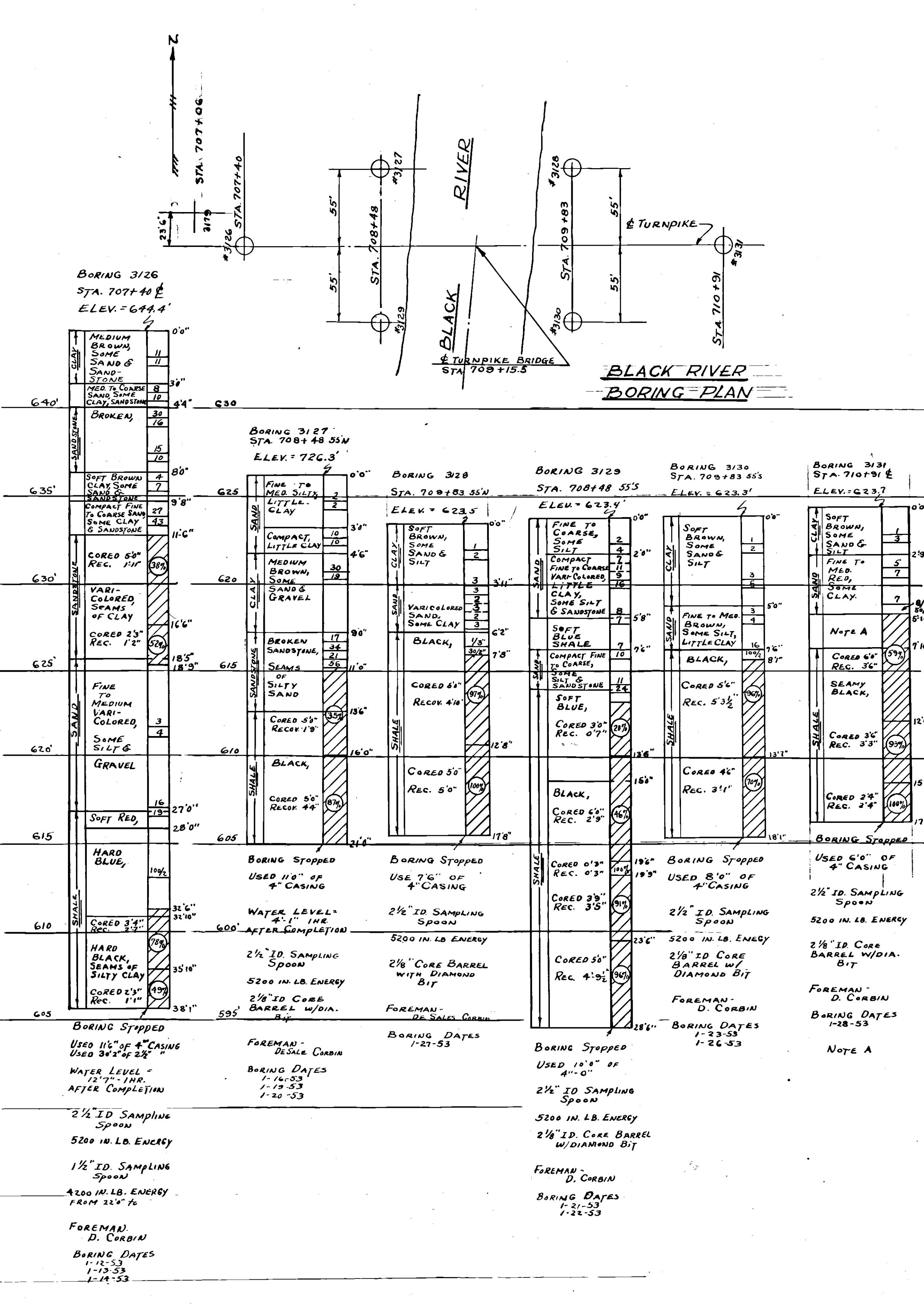










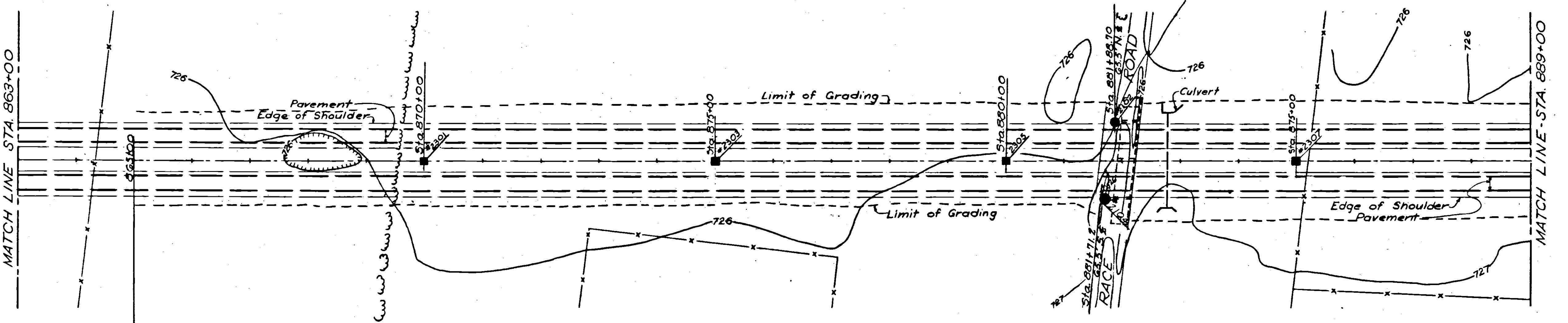


GENERAL NOTES

OHIO TURNPIKE COMMISSION

TEST BORINGS
CUYAHOGA COUNTY STA. 707+40 - STA. 683+85
KNAPPEN TIBBETTS - ABBETT - MC CARTHY
CONTRACTING ENGINEER
RAYMOND CONCRETE PILE CO. DRILLING CONTRACTOR
CONTRACT B-7A
C.P.C. Job No. B-10450-D

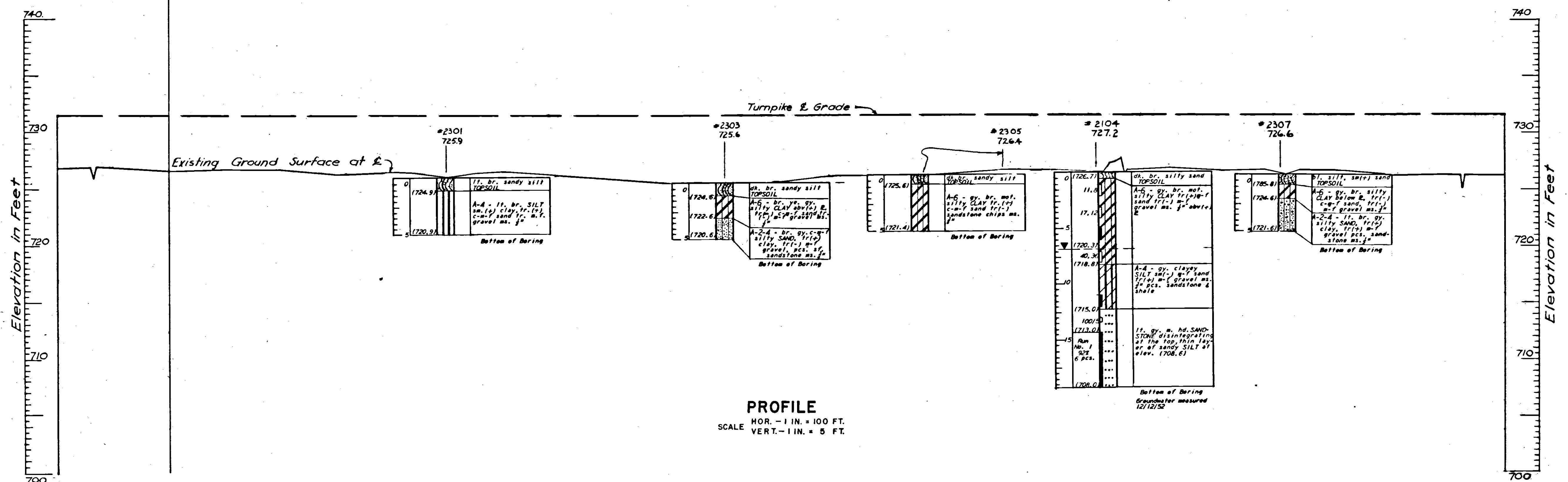
For details of Boring No 2102 see
respective Laboratory Log in
book entitled "Ohio Turnpike
Project No 1 Subsurface Explora-
tion Laboratory Logs Contract C-22."



PLAN

SCALE: 1 IN. = 100 FT.

End of Contract C-23 Begining of Contract C-22
STA. 865+00



PROFILE

SCALE HOR. - 1 IN. = 100 FT.
VERT. - 1 IN. = 5 FT.

FOR NOTES AND LEGEND SEE DWG. NO. 485-217

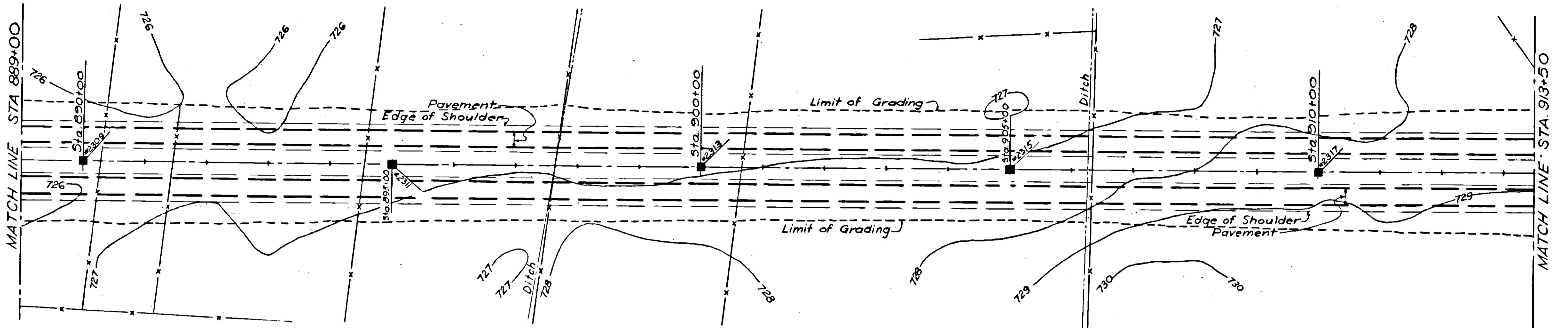
OHIO TURNPIKE COMMISSION
OHIO TURNPIKE PROJECT NO. 1

MASTER SOIL PROFILE STA. 865+00 TO STA. 889+00

KNAPPEN - TIPPETTS - ABBETT - McCARTHY
CONTRACTING ENGINEER
DESIGN SECTION D-7

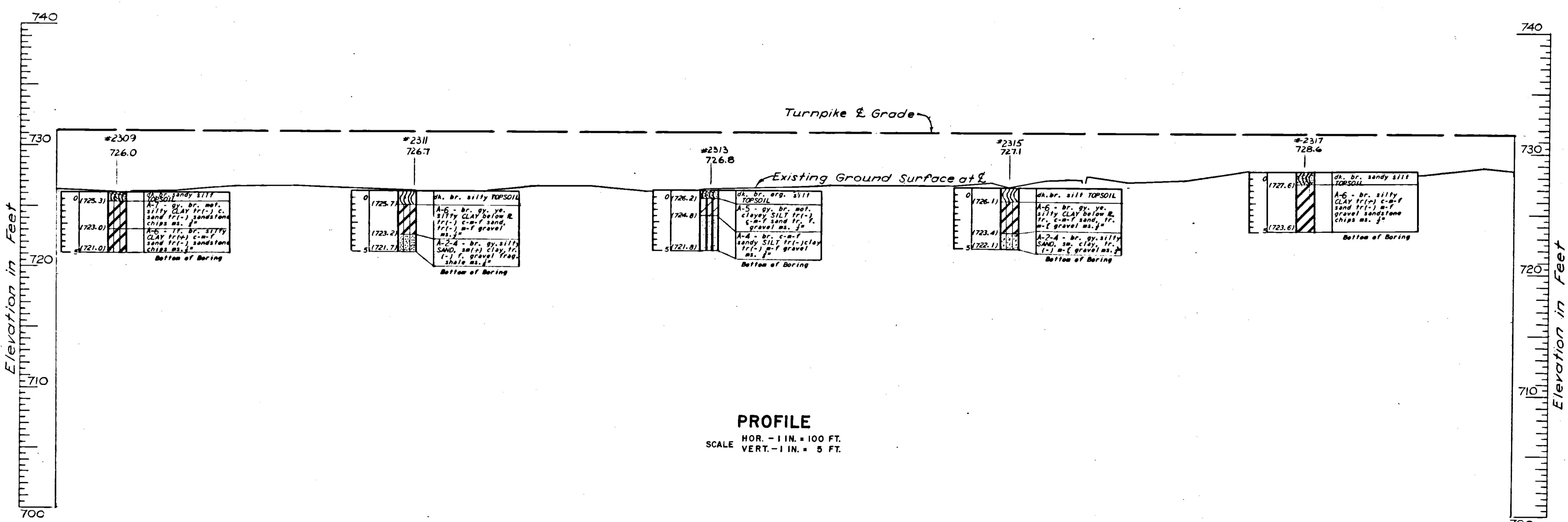
| | | |
|-------------------|------------------|-----------------|
| DESIGNED: S.S.C-Y | CHECKED: S.S.C-Y | DATE: 6/12/58 |
| DRAWN: L.D.L.T. | IN CHARGE: J.L. | SCALE: AS NOTED |

CONTRACT NO. C-22 DWG. NO. 485-209



PLAN

SCALE: 1 IN. = 100 FT.



FOR NOTES AND LEGEND SEE DWG. NO. 485-217

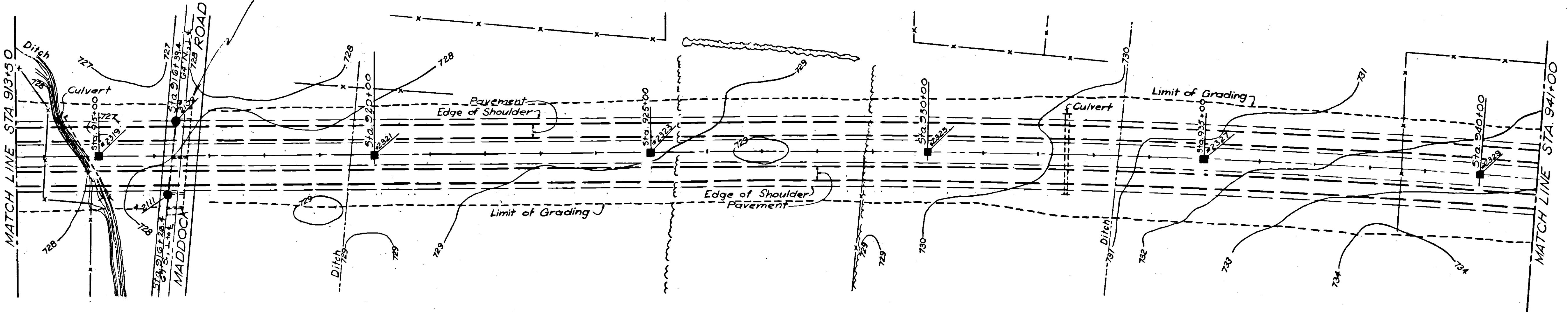
OHIO TURNPIKE COMMISSION
OHIO TURNPIKE PROJECT NO. I

MASTER SOIL PROFILE
STA. 889+00 TO STA. 913+50

KNAPPEN - TIPPETTS - ABBETT - McCARTHY
CONTRACTING ENGINEER
DESIGN SECTION D-7

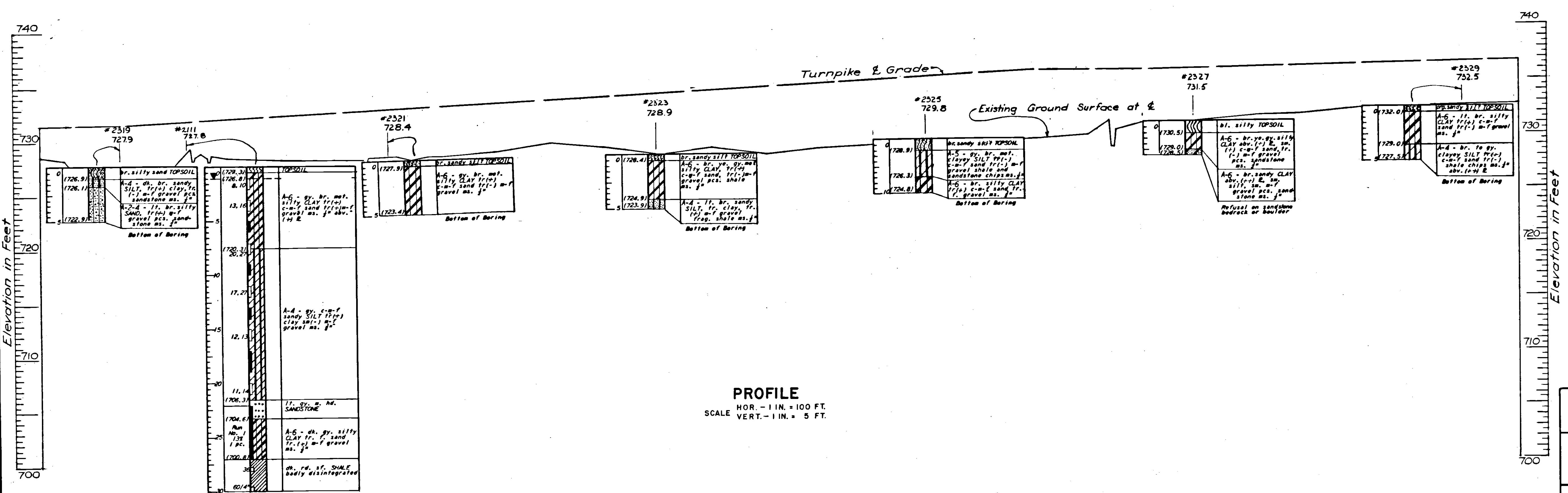
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|------------------------------------|------------------|-----------------|
| DESIGNED: S.S.C-Y | CHECKED: S.S.C-Y | DATE: 6/12/53 |
| DRAWN: L.D. + L.T. | IN CHARGE: J.L. | SCALE: AS NOTED |
| CONTRACT NO. C-22 DWG. NO. 485-210 | | |

For details of Boring No. 2109 see
book entitled "Ohio Turnpike Project
No. 1 Subsurface Exploration Laboratory Logs Contract C-22."



PLAN

SCALE: 1 IN. = 100 FT.



PROFILE

SCALE HOR. - 1 IN. = 100 FT.
VERT. - 1 IN. = 5 FT.

OHIO TURNPIKE COMMISSION
OHIO TURNPIKE PROJECT NO. 1

MASTER SOIL PROFILE
STA. 913+50 TO STA. 941+00

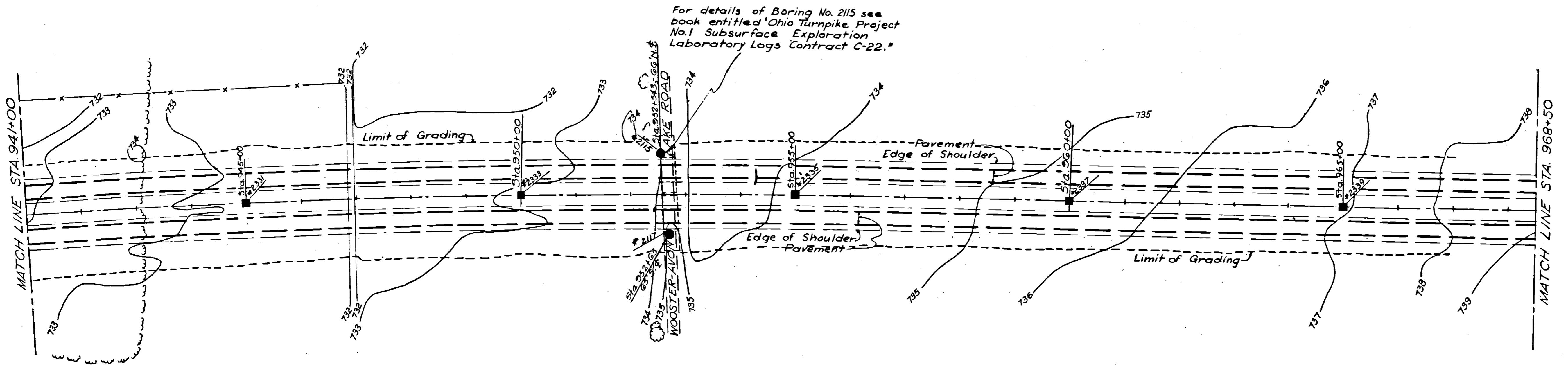
KNAPPEN - TIPPETTS - ABBETT - McCARTHY
CONTRACTING ENGINEER
DESIGN SECTION D-7

| | | |
|-------------------|------------------|-----------------|
| DESIGNED: S.G.C-Y | CHECKED: S.G.C-Y | DATE: 5/12/55 |
| DRAWN: L.D., LT. | IN CHARGE: J.L. | SCALE: AS NOTED |

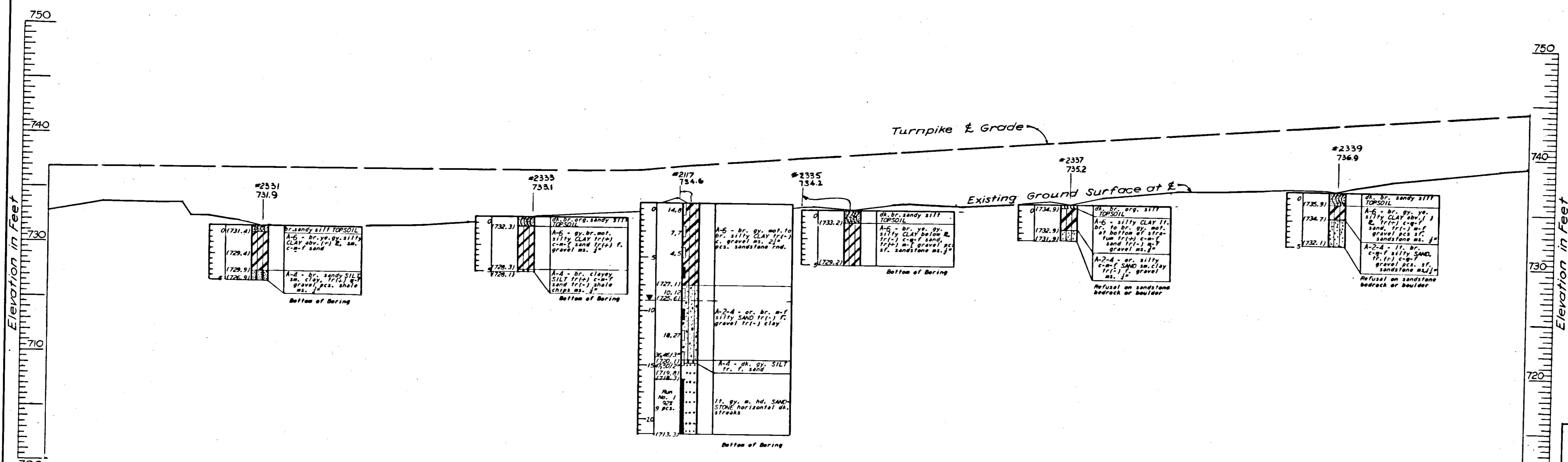
CONTRACT NO. C-22 DWG. NO. 485-2II

(697-B)

5/12/55

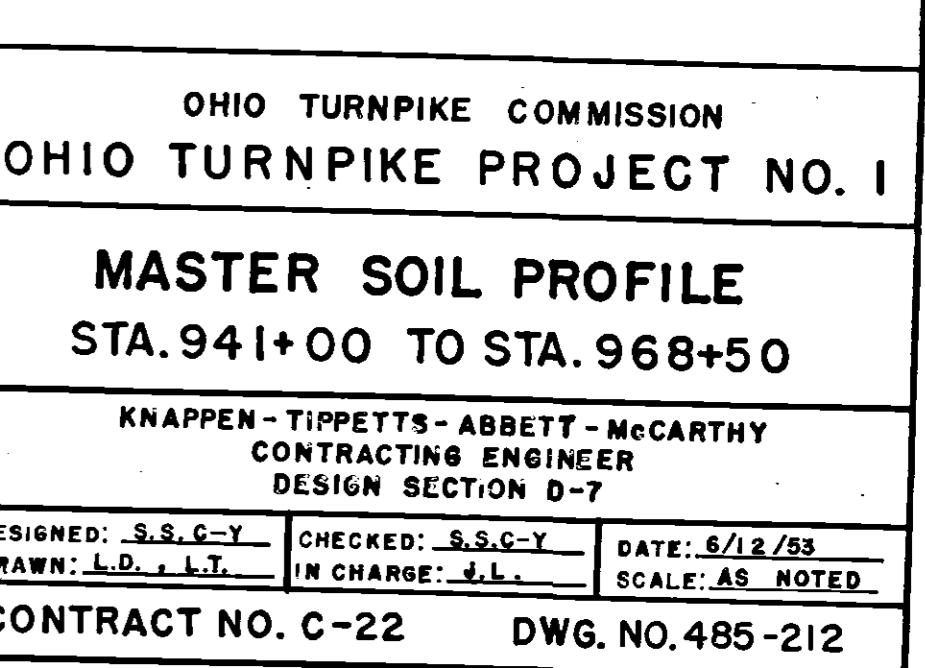


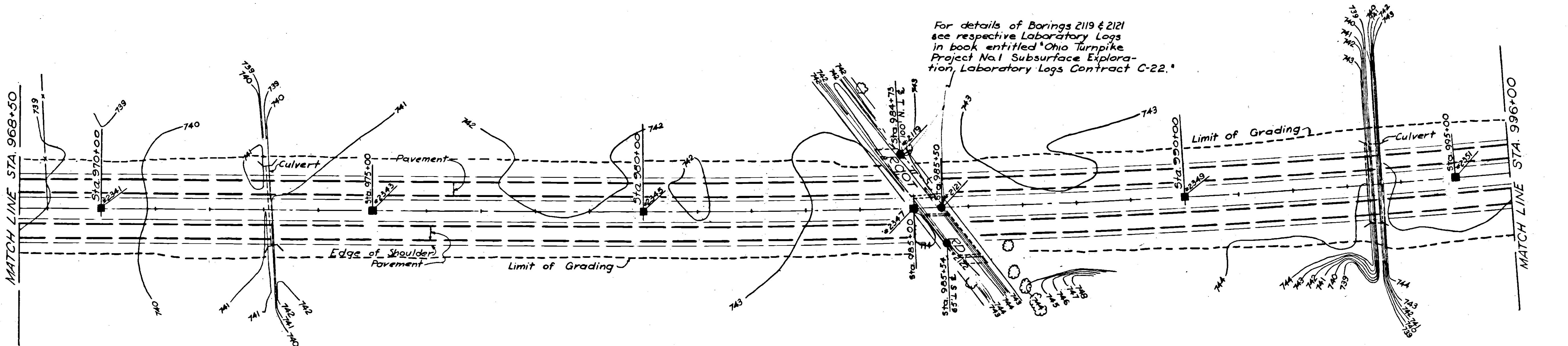
PLAN



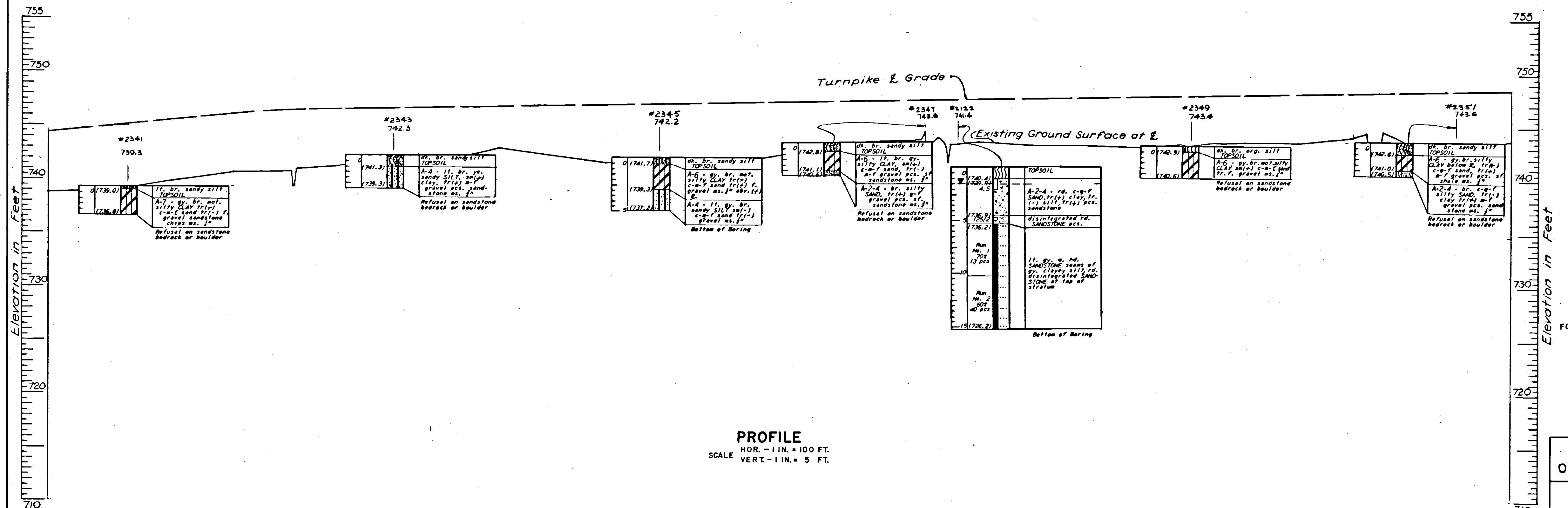
FOR NOTES AND LEGEND SEE DWG. NO. 485-217

PROFILE





PLAN



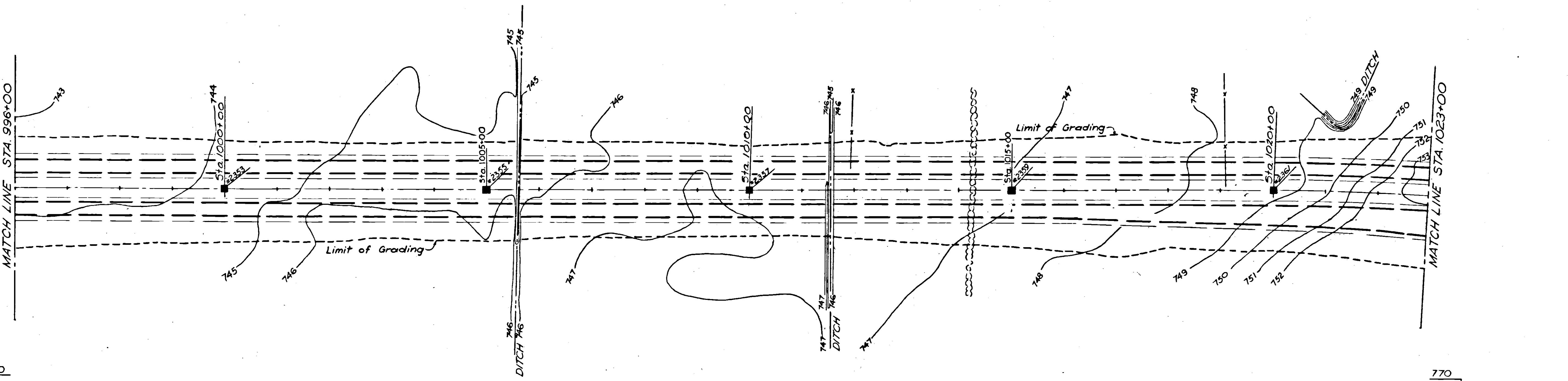
OHIO TURNPIKE COMMISSION
OHIO TURNPIKE PROJECT NO. I

MASTER SOIL PROFILE STA 968+50 TO STA 986+00

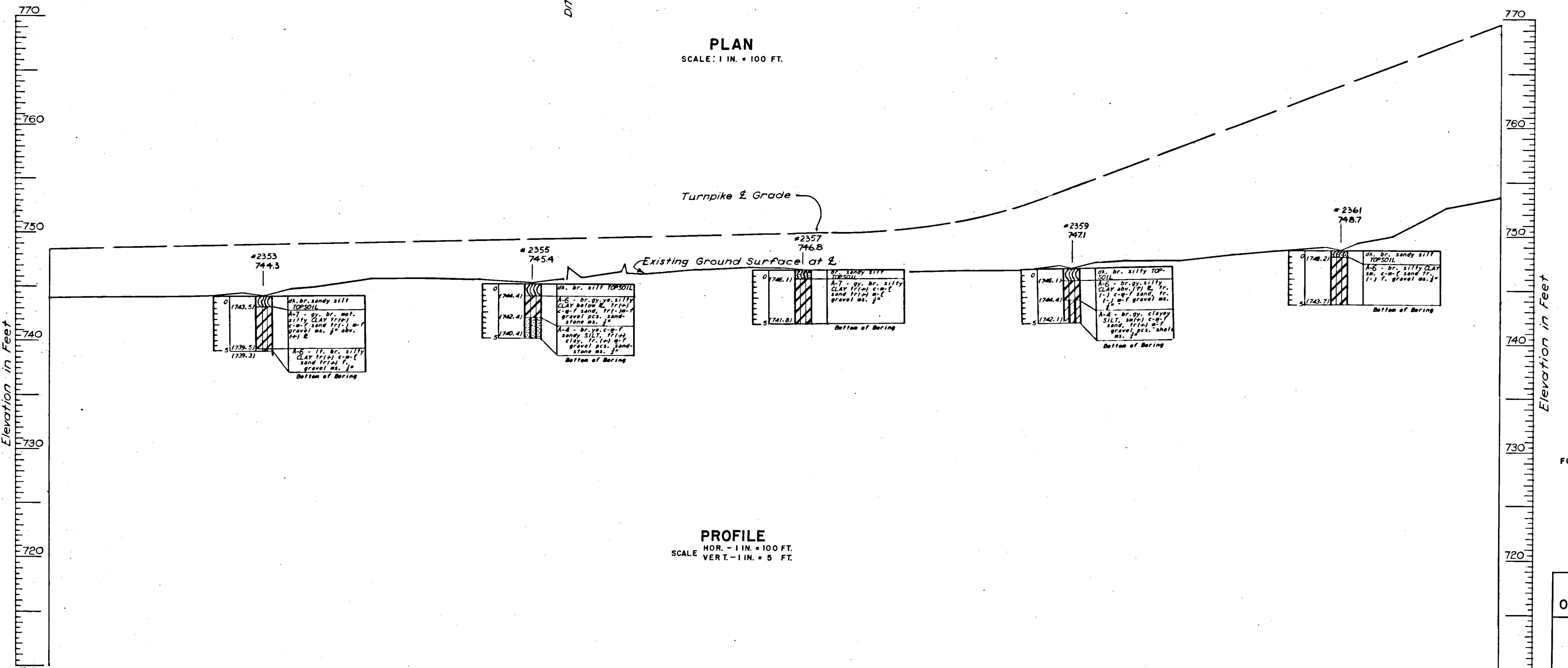
**NAPPEN - TIPPETTS - ABBETT - McCARTHY
CONTRACTING ENGINEER
DESIGN, CONSTRUCTION**

| | | |
|--------------------|--------------------------------------|----------------------------------|
| S.S.C-Y ., L.T. | CHECKED: S.S.C-Y IN CHARGE: J. L. | DATE: 6/12/53 SCALE: AS NOTED |
|--------------------|--------------------------------------|----------------------------------|

ACT NO. C-22 DWG. NO. 485-213

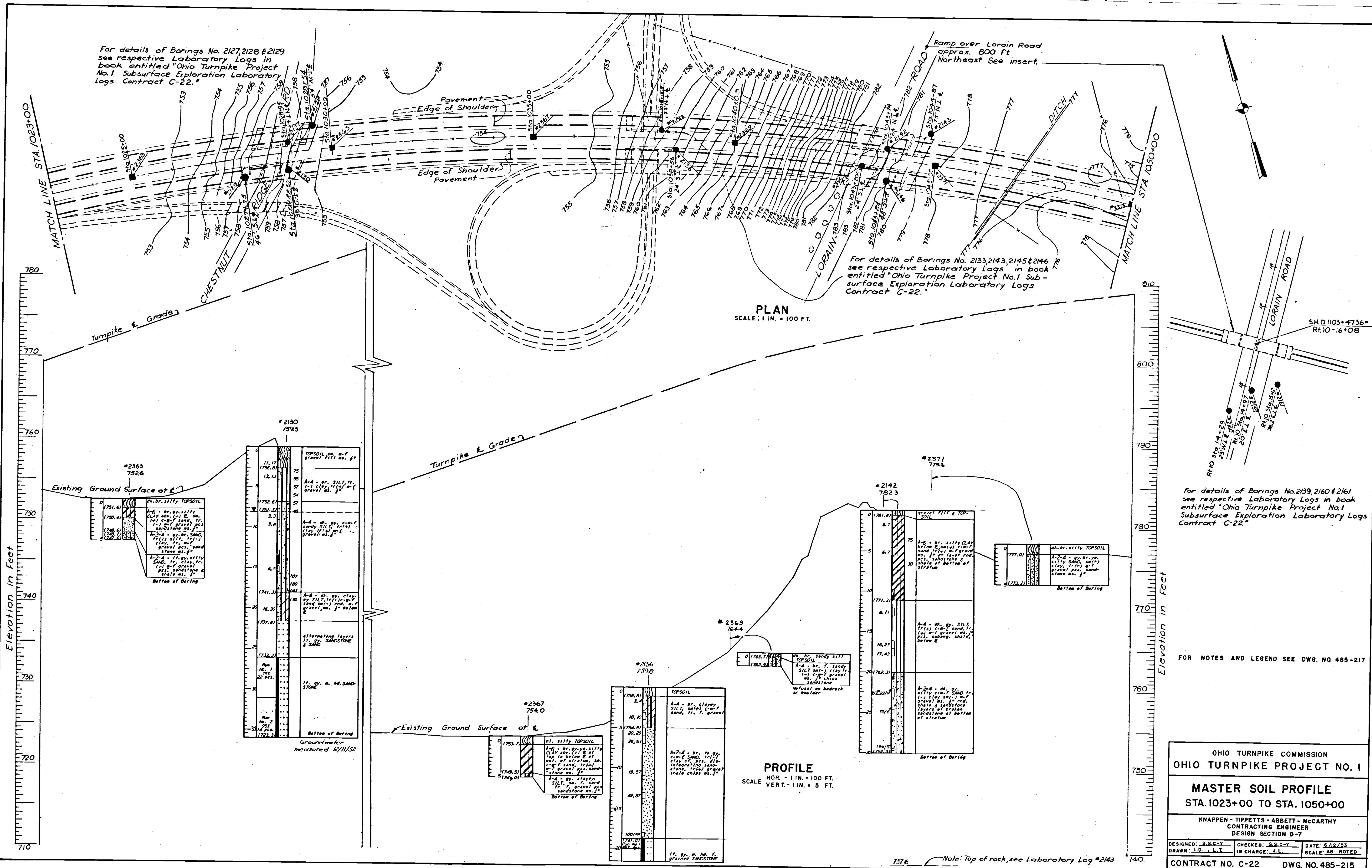


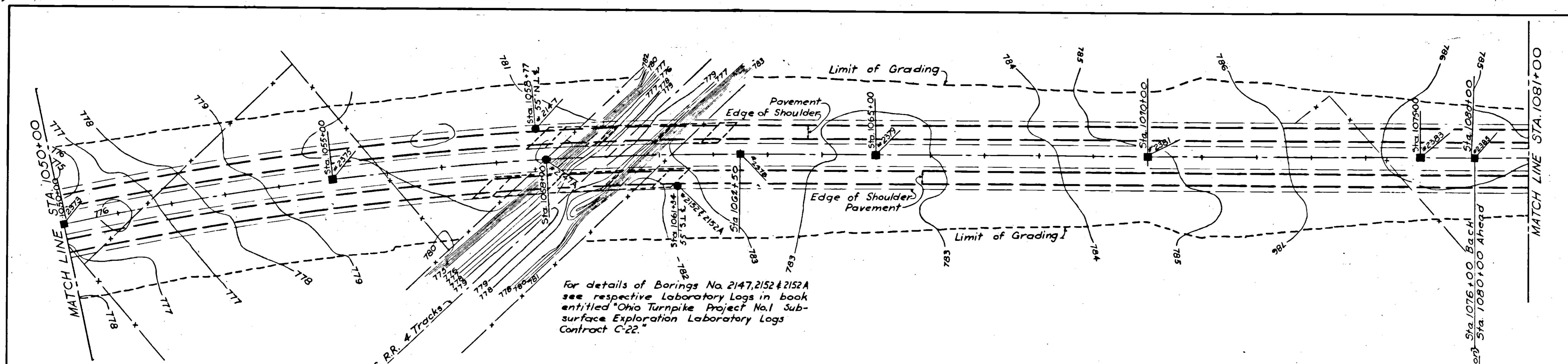
PLAN
SCALE: 1 IN. = 100 FT.



PROFILE
SCALE HOR. - 1 IN. = 100 FT.
VERT. - 1 IN. = 5 FT.

| | | |
|--|------------------|-----------------|
| OHIO TURNPIKE COMMISSION OHIO TURNPIKE PROJECT NO. 1 | | |
| MASTER SOIL PROFILE STA. 996+00 TO STA. 1023+00 | | |
| KNAPPEN - TIPPETTS - ABBETT - McCARTHY CONTRACTING ENGINEER DESIGN SECTION D-7 | | |
| DESIGNED: S.S.C-Y | CHECKED: S.S.C-Y | DATE: 6/12/53 |
| DRAWN: L.D., L.T. | IN CHARGE: J.L. | SCALE: AS NOTED |
| CONTRACT NO. C-22 DWG. NO. 485-214 | | |

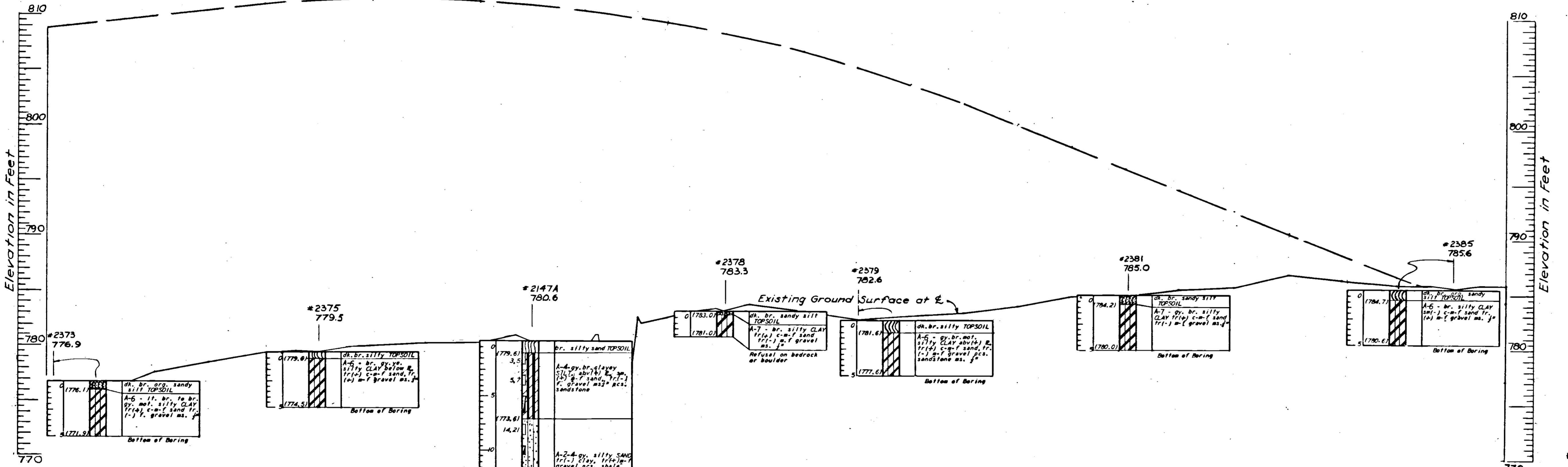




PLAN
SCALE: 1 IN. = 100 FT.

SCALE: 1 IN. = 100 FT.

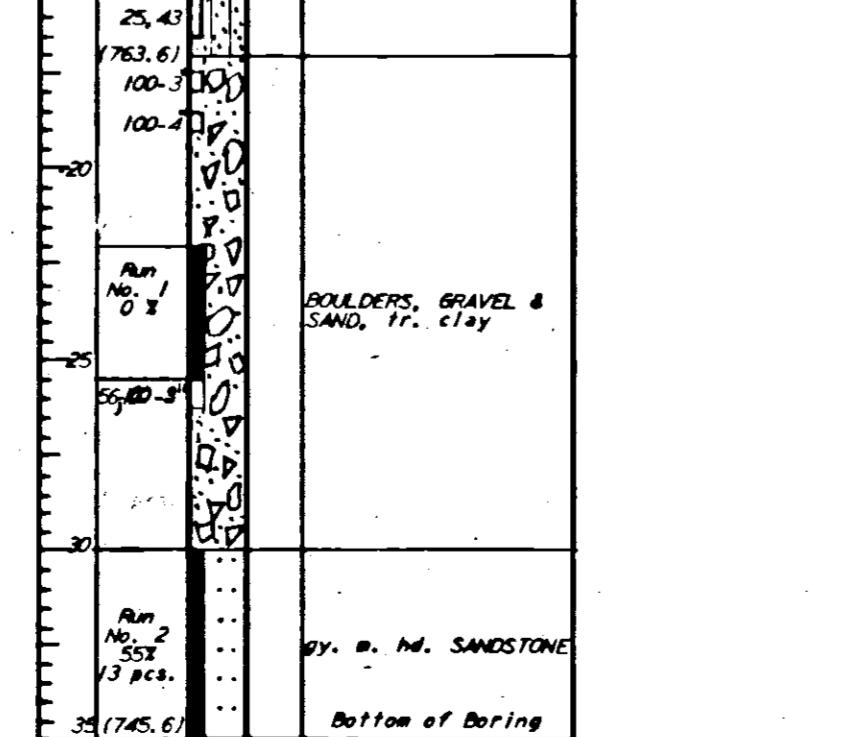
For details of Borings No 2147, 2152 & 2152A
see respective Laboratory Logs in book
entitled "Ohio Turnpike Project No.1 Sub-
surface Exploration Laboratory Logs
Contract C-22."



FOR NOTES AND LEGEND SEE DWG NO 485-217

PROFILE

SCALE HOR. - 1 IN. = 100 FT.
VERT. - 1 IN. = 5 FT.



OHIO TURNPIKE COMMISSION
OHIO TURNPIKE PROJECT NO. 1

MASTER SOIL PROFILE

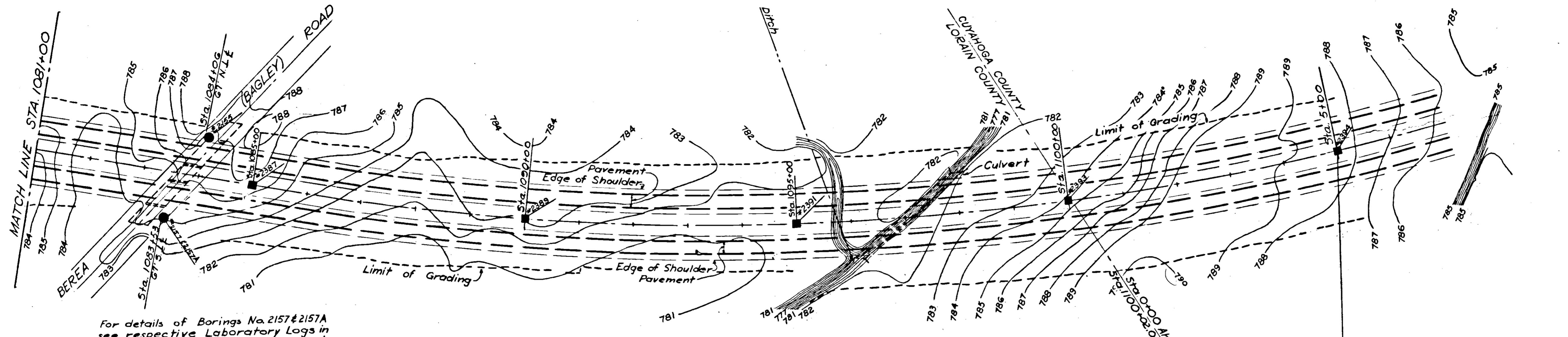
STA. 1050+00 TO STA. 1081+00

**KNAPPEN - TIPPETTS - ABBETT - McCARTHY
CONTRACTING ENGINEER
DESIGN SECTION D-7**

DESIGN SECTION 0-7

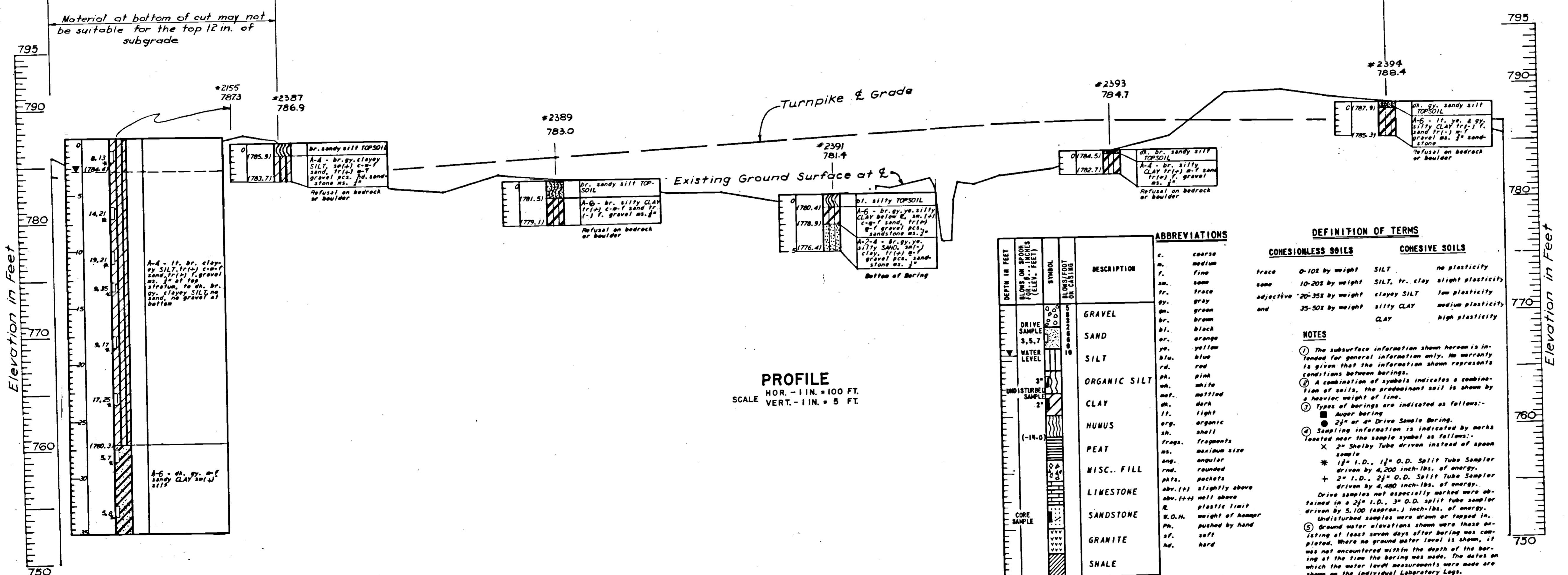
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| DESIGNED: S.S.C-Y | CHECKED: S.S.G-Y | DATE: 6/12/53 |
| DRAWN: L.D., L.T. | IN CHARGE: J.L. | SCALE: AS NOTED |

CONTRACT NO. C-22 **DWG. NO. 485-216**



For details of Borings No 2157 & 2157A
see respective Laboratory Logs in
book entitled "Ohio Turnpike Project
No. 1 Subsurface Exploration Laboratory Logs Contract C-22."

PLAN
SCALE: 1 IN. = 100 FT.



OHIO TURNPIKE COMMISSION

OHIO TURNPIKE PROJECT NO. 1

MASTER SOIL PROFILE STA. 1081+00 TO STA. 5+00

KNAPPEN - TIPPETTS - ABBETT - McCARTHY
CONTRACTING ENGINEER
DESIGN SECTION D-7

DESIGNED: S.S.C-Y CHECKED: S.S.C-Y
DRAWN: L.D., L.T. IN CHARGE: J.L. DATE: 6/12/58
SCALE: AS NOTED

CONTRACT NO. C-22 DWG. NO. 485-217